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THE IRON TRADE REVIEW

VOLUME XXXI. CLEVELAND, O. SEPTEMBER 22, 1898. CHICAGO, ILL. NUMBER 38

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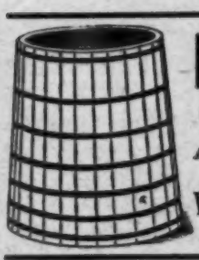

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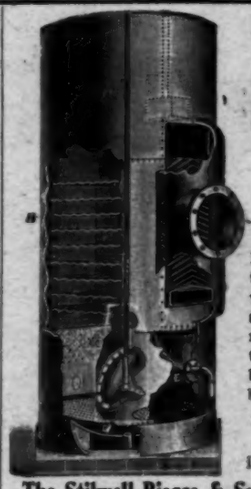

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THE IRON TRADE REVIEW

VOLUME XXXI. CLEVELAND, O. SEPTEMBER 22, 1898. CHICAGO, ILL. NUMBER 38

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The end of the gentlemen's agreement on steel rails, which has been effective since the beginning of the year, came in the past week—the result of cutting on Chicago and Pittsburg business. At a meeting on Thursday in New York the effort will be made to restore the basis of $18 Pittsburg and $20 Chicago on standard sections. A 25,000-ton sale is reported from Pittsburg, but there has been no rush of business as in the famous pool break-up of last year, and makers expect to restore the former status. Inquiries on contracts for 1899 have begun and the predictions are that the coming year's tonnage will quite exceed that for 1898—a factor of first importance in calculations concerning the steel market next year. Apart from the disturbance in rails, the market of the week has shown only a continuance of the conditions recently noted. In spots foundry iron has been slightly more active. One Southern producer, because of export sales and a total of 300,000 tons on its order books, rather than any new demand at home, marked up prices 25 cents, on Monday, making No. 2 foundry $7.75 at Birmingham. On the other hand the large buyers have provided for themselves for some months to come, and the balance of the year is expected to bring no marked developments. Northern foundry furnaces are in a stronger position but outside of the Chicago district are still relatively lower than Southern furnaces, thus getting the bulk of the small-lot trade. Conferences of the Bessemer producing furnacemen of the Mahoning and Shenango valleys have been held in the week, both in general and committee sessions. An effort is making to devise a selling agency plan, and a fair distribution of the burden of idle time. Whether this will be by 30-day suspensions as often as necessary or by purchasing the idleness of certain furnaces has not been determined. A proposition to erect another steel works, for which the 18 furnaces in the agreement shall furnish the capital, is also under consideration. The market for Bessemer iron stands $9.90 to $10, in the valley, some small amounts of iron being at the disposal of dealers as deliveries on old contracts mature. Gauged by the demand for finished material, which is the final test of conditions in primary products, the situation is conspicuously strong. Some mills are yet more congested than in the summer, and even in those lines in which prices have been slow to respond to the general movement, the number of sellers willing to make the minimum price is smaller. Steel bars have advanced $1 a ton to 1c Pittsburg, and in some instances higher quotations are made. Plate orders continue to exceed shipments from mills. Chicago secured a contract for 2,500 tons for Victoria, B. C., against foreign and home competition, and Pittsburg closed some good Eastern business. Government work has brought considerable tonnage to Pittsburg structural mills, and a 2,500 ton order for a new lake vessel was divided between Cleveland and Pittsburg, the latter getting the shapes. Tin plate works are paying a part of the advance in steel on the contracts for 1899 and in turn are taking business for next year at concessions from current prices, an anomalous procedure in view of the confident predictions concerning the pending combination deal.

PITTSBURG.

OFFICE OF *The Iron Trade Review and Industrial World.*
808 TRADESMEN'S BUILDING, Sept. 21.

The latter part of last week saw more buying and inquiries than in the earlier portion and this improved condition still holds. The meeting of the valley furnacemen last Saturday was without result so far as advancing prices was concerned.

PIG IRON.—The movement in the week has been very quiet. Consumers are filled for the rest of the year, practically, which accounts for the quietness. What little iron comes into Pittsburg is bought at about $10.50 to $10.55 delivered here. It nets $10 at the valley furnace in most cases, however, the freight being the yielding factor in the transaction. Gray forge is rather quiet. It is quoted $9 to $9.10 valley, and from $9.40 to $9.50 Pittsburg. Foundry irons are quiet. The movement is rather slow. No. 12 is quoted from $10.10 to $10.25. Prices are as follows:

Bessemer, valley furnace	$ 10.0 0
Bessemer, Pittsburg	10.50 to 10.55
No. 1 Foundry	10.50 to 10.65
No. 2 Foundry	10.10 to 10.25
No. 3 Foundry	9.65 to 9.85
Gray Forge, valley furnace	9.00 to 9 10
Gray Forge, Pittsburg	9.35 to 9.45

BILLETS.—The latter part of last week developed more trade than was promised in the early days of the week. A number of Eastern inquiries came to up and one sale of 2,000 tons and at $16.10 maker's mill, Pittsburg, was made to an Eastern buyer. Another sale of 2,500 tons for delivery the latter part of this year and the early part of next year, at approximately the same price, was also made. Some small lots, ranging from 200 to 300 tons and calling for prompt delivery, have brought $16.25 at the mill. Sheet and tin plate bars are getting better delivery now than for some time past. They are quoted from $17.50 to $17.75. Rods are scarce and still quoted at $22. The mill that was crippled by the breaking of a shaft is still shut down, although hopeful of running before the week is out. The Shenango Valley Steel Co. expects to start its sheet and tin plate bar mill this week.

IRON AND STEEL SKELP.—The skelp mills are so fully sold up as to be practically out of the market for the next 60 days and firmer quotations have resulted. Unless the order is attractive, quotations are withheld, or if made the figure is rather high. The demand for sheared iron skelp is particularly good and has caused an advance. Prices are as follows: Grooved iron skelp, 1.10c to 1.12½c; sheared iron skelp, 1.22½c to 1.25c; grooved steel skelp, 1.22½c to 1.25c; grooved steel skelp, 1.02½c to 1.05c; sheared steel skelp, 1.10c to 1.12½c.

PIPES AND TUBES.—Business is so good and the demand so urgent in some cases that if the manufacturer does not have exactly what the buyer wants the latter will take the nearest to it he can get, and sometimes pay as much as 20 per cent above regular price for expedited delivery. No advance in prices was declared at the meeting of the boiler tube makers in Pittsburg last week. The additional discounts of six tens for less than carloads and six tens and two and a half per cent off list for carload lots are still quoted. Base discounts are as follows: Butt weld, black, 55 per cent off; lap weld, black, 65 per cent off; butt weld, galvanized, 47½ per cent off; lap weld, galvanized, 52½ per cent off. Discounts on

merchant boiler tubes are as follows: 2¼-inch and smaller, 72½ per cent off; 2½ inch and larger, 75 per cent off. Inserted joint casing is now quoted at 60 off and screw and socket joint casing at 60 and 10 per cent off.

SHEETS.—The volume of business is excellent, the mills being in good condition, on both black and galvanized sheets. The quotation on No. 28 is 1.95c. Galvanized sheets are quoted at 80 and 10 per cent off list with usual freight allowance.

STRUCTURAL MATERIAL.—New orders and specifications on those placed some time back are coming in in good volume. The recent Government order for several thousand tons which was given to a local mill and the contract for furnishing 6,000 tons for New York buildings which will without doubt come to a Pittsburg mill, are the largest in sight. Prices continue unchanged and are as follows: Beams and channels, 3 to 15 inches, 1.20c; 18 to 24 inches, 1.30c; tees, 1.25c; zees, 1.20c and angles 1.10c. Universal plates alone at 1.15c; with other shapes 1.05c.

SPIEGEL.—Prices are from $23.50 to $24 with quiet demand.

FERRO-MANGANESE.—The quotation is $50 for 80 per cent domestic delivered. The market is quiet.

PLATES.—One of the largest Eastern shipyards recently placed an order for between 9,000 and 10,000 tons of ship plates, with a local mill. The mills are crowded and they are behind in deliveries, as they have been in fact for some time. There has been no change from last week's quotations, which are as follows: Tank, 1.15c; shell, 1.20c; flange, 1.25c; fire box, 2c and upwards.

RAILS AND TRACK SUPPLIES.—The local interest that makes a large tonnage of track materials reports plenty of business in spikes and links and pins. The former are quoted at 1.45c to 1.50c; the latter at 1.20c. A prominent railway placed an order in the last few days for 25,000 tons of standard rails with a local mill, for delivery through the next year. Light sections are quoted at $19 to $19.50 and heavy sections at $18. Other prices are as follows: Track bolts, 1.65c to 1.70c; splice bars, 1.10c to 1.15c.

SPELTER.—The high price of last week has been maintained with remarkable steadiness, considering recent fluctuations. The present price is $4.90 to $4.95.

OLD MATERIAL.—The fair movement noted last week continues but there are too many eager sellers to permit of any serious effort to advance prices. The largest sale noted in the week was 1,000 tons heavy melting steel at $10.50. Other prices are as follows: No. 1 wrought scrap, $12, net; bushelling scrap $9, net; car wheels, $10.25, gross; cast borings, $6; railroad cast scrap, $9, gross; iron axles, $6, net; steel axles, $12.50, gross; charcoal scrap, $10, gross; billet and bloom ends, run of mill, $11; machinery scrap, $9, gross; wrought turnings, $8, gross; steel rails, $10. A 50 ton lot, of iron rails brought $14, gross. As noted before, the scarcity of old iron rails is more pronounced.

CHICAGO.

OFFICE OF *The Iron Trade Review and Industrial World*, 1532 MONADNOCK BLOCK, Sept. 21.

The most important news of the week is the dissolution of the rail agreement, which has been in existence since the first of the year. This provided for a price of $18, Pittsburg, and $20, Chicago, freight rates for other points to be equalized. The rupture is caused, according to representatives of an Eastern mill, by a sale of 2,000 tons of rails which was made to the Vandalia Line recently by the Illinois Steel Co. The latter company maintains, however, that while the sale was made at $18, that price was made at Pittsburg rate, as the Vandalia is part of the Pennsylvania system, and does its own hauling from Pittbsburg to point of use; consequently the sale should take Pittsburg price. A sale of 16,000 tons to the Oklahoma & Gulf road was made recently by Pittsburg interests, it is claimed, at $16.50, Pittsburg The break in the agreement was announced the first of this week, and no other sales at very low prices have been made as yet. The rail makers hold a meeting in New York on Thursday of this week, at which the difficulty may be adjusted. There is expected to be a very large tonnage of rails placed the coming year, and some figuring is already being done by the railroads for their requirements for 1899. Other lines of material have been quiet, with a large demand for all kinds of steel, although sales have not been especially large in this territory, the mills not beng in position to accept heavy business for early delivery.

PIG IRON.—The market is not especially active; furnaces are not pushing for business, being well sold up for the balance of the year. The foundries in this territory are nearly all working full, and are using large quantities of iron, taking deliveries as fast as the furnaces can make them. Two or three good sized inquiries are in the market which may be closed soon, but sales last week were nearly all of the small order class. The largest reported was of 1,000 tons, other business ranging from that down to car lots. The furnaces are firm in their views, and almost no talk is heard of price cutting, on the part of either Northern or Southern furnaces. Quotations are unchanged as follows:

Lake Sup. Charcoal	$11 50 @ $13 00	Southern Coke No. 3	$ 10 [illegible]
Local Coke Fdy. No. 1	11 50 @ 12 00	Southern No. 1 Soft	10 85
Local Coke Fdy. No. 2	11 00 @ 11 50	Southern No. 2 Soft	10 60
Local Coke Fdy. No 3	10 75 @ 11 00	Southern Silveries	11 25 @ 11 50
Local Scotch Fdy. No.1	11 50 @ 12 00	Jackson Co. Silveries	12 50 @ 14 50
Local Scotch Fdy. No.2	11 00 @ 11 50	Ohio Strong Softeners	12 00 @ 12 50
Local Scotch Fdy. No.3	10 75 @ 11 00	Alabama Car Wheel	15 00 @ 16 00
Southern Coke No. 1	10 85	Malleable Bessemer	11 50 @ 12 00
Southern Coke No. 2	10 60	Coke Bessemer	11 50 @ 12 00

BARS.—Considerable business is being done in small lots, but there are very few large transactions to report. The demand is good, and the mills are getting firmer in their views all the time. While there are still a few makers of bars willing to sell at 1.05c, nearly all the mills want more, and 1.10c is the usual quotation. Guaranteed iron is quoted at 1.15c to 1.20c, and soft steel bars at 1.15c to 1.20c. An attempt was made recently to get all the steel mills to make a uniform price of 1.20c Pittsburg, but lower prices are still to be had.

RAILS AND TRACK SUPPLIES.—The dissolution of the last rail agreement has not resulted in any large sales of rails as yet, but several large inquiries are in the market, and it is quite likely some will be closed very soon, in view of the recent developments of the situation. Rail makers hold a meeting on Thursday of this week at New York, and until then the market is an open one, with prices almost unquotable. Sales are said to have been made at $18, Chicago, and $16.50 Pittsburg. Other quotations are as follows: Steel splice bars, 1.15c to 1.25c; track bolts with square nuts, 1.80 to 1.90c; hexagon nuts, 1.90c to 2c; spikes, 1.55c to 1.60c.

BILLETS AND RODS.—Sales of about 3,000 tons of billets were made in this market last week, and there is a good demand. The quotation is now $17 to $18.50. Rods are quiet, with small sales, although large transactions could be made if the mills were willing to accept the business for early delivery. They are quoted at $22.50 to $23. The South Chicago rod mill, which has not been running for a week or more, started up again on Tuesday of this week.

CAR ORDERS.—An order for 1,000 cars was given out last week by a Western road, and other oders ranging in size from 500 cars down were taken. Car works are full of business, and car material is in large request, with good sales every week.

PLATES.—There is a good demand for all kinds of plates, with an especially large business going in material for railroad work. Considerable sales are being made all the time. The market is very firm. Quotations are made as follows: Tank plates, 1.20c to 1.30c; flange steel, 1.30c to 1.40c; fire box steel, 1.85c to 5c.

STRUCTURAL MATERIAL.—No large contracts were placed last week, but sales were fully up to the average, as a large tonnage of comparatively small orders was placed with the mills. The market is firm and quotations are unchanged: Beams, 15 inch and under, 1.35c to 1.40c; 18-inch and over, 1.45c to 1.50c; angles, 1.25c to 1.30c; plates, 1.20c to 1.30c; tees, 1.40c to 1.45c; zees, 1.35c to 1.40c. Small lots from stock are quoted at ¼c to ½c higher.

SHEETS.—There is a heavy demand and large sales of both black and galvanized sheets. Several good sized orders of both kinds were closed last week, and more business is in sight. The market is firm at 2.10c to 2.15c for black and 50 and 5 per cent discount for galvanized.

MERCHANT STEEL.—Buyers continue to take considerable quantities of steel, sales last week being fully as large as those of the week previous. There are a number of good sized inquiries in the market which will be closed soon. Quotations are as follows: Open-hearth spring, tire and machinery steel, 1.65c to 1.75c; smooth finished machinery steel, 1.60c

to 1.70c; smooth finished tire, 1.50c to 1.60c; tool steel, 5.50c to 7.50c; specials, 11c and upwards.

SCRAP.—Some sales of old iron rails have been made, but none of great importance. Steel rails are in fairly good demand, and a few good sales were made last week. Dealers appear to be looking for somewhat higher prices in the near future. Dealers' selling prices are as follows:

Old iron rails, gross,	$12 50@$12 75	Axles, net	$14 25@$14 75
Old steel rails, long, gr.	10 50@ 11 00	Cast borings, net	4 25@ 4 50
Old steel rails, short	8 75@ 9 00	Wrought turnings, net	6 00@ 6 50
Old wheels, gross	11 00@ 11 50	Axle turnings, net	7 00@ 7 25
Railroad forge, net	11 50@ 12 00	Mixed steel, gross	7 25@ 7 50
Dealer's forge, net	10 00@ 10 50	Stove plates, net	5 75@ 6 00
No. 1 mill, net	7 50@ 8 00	Heavy melting steel, gr.	8 25@ 8 50
Heavy cast, net	8 50@ 9 00	Old iron splice b., net.	12 75@ 13 00
Malleable cast, net	8 00@ 8 50		

CLEVELAND.

OFFICE OF *The Iron Trade Review and Industrial World*, 27 VINCENT ST., Sept. 21.

The shortage sure to be met with on the estimated production of certain mines continues to be the feature of the ore situation, and its bearing on lake freights is appreciated, also. From time to time the scarcity of miners at individual properties has been noted through the season. The extent of the diversion of labor to other employments, temporarily in some cases, permanently in others, is now made evident in a cumulative way. Recent purchases for Chicago, amounting to 200,000 tons, were to replace Mesabi ores that cannot be mined before the end of the season, and one Gogebic property of a consuming interest will fall short considerably. The grain movement, while not what was expected thus far, has advanced ore rates a trifle. The Chicago rate on corn advanced to 1¼c, which brought Escanaba ore up to 50 cents. Sixty cents was paid Tuesday from the head of the lake, which would make the Marquette rate 55 cents. At most Lake Erie docks there is as great a scarcity of cars for ore as was noticed a year ago, after the coal strike, and the proportion of dock ore is increasing.

PIG IRON.—There has been practically no inquiry for valley Bessemer iron in the past week. A meeting of furnacemen was held on Saturday, Sept. 17, and committee meetings have been held since, preparatory to another general conference. The plan proposed by some in the early stages of the organization, by which a single selling agency was to be established for all the 18 furnaces is again under consideration. A tighter compact than has existed may be the result. It is appreciated that under present conditions the product of all the merchant furnaces, under steady operation, cannot be taken up. The problem is how to distribute the slack time and equalize the attendant burdens. We quote furnace Bessemer iron at $10 in the valley and outside iron at $9 90. Foundry iron has been rather more active than in the preceding week, and prices are generally firmer in view of the Southern producers' attitude. While $9 50 has been done, $9 75 valley, is a common quotation on No. 2. Water shipments of foundry iron are being made from Cleveland to points in the Northwest. We quote f. o. b. Cleveland:

Bessemer	$10 65	Valley Scotch No. 1	$10 65
No. 1 Strong Foundry	10 40@10 65	Valley Scotch No. 2	10 15@10 40
No. 2 Strong Foundry	10 15@10 25	Gray Forge	9 50
No. 3 Foundry	9 65@ 9 90	Lake Superior Charcoal	11 50

BILLETS AND RODS.—Some further purchases of sheet and tin plate bars are pending, one buyer being in the market for several thousand tons of the latter. We quote billets and slabs at $16.25 and tin plate bars at $17.75 to $18. Rods are firm at $22, with few to be had.

FINISHED MATERIAL.—Steel bars have advanced about $1 a ton. On Cleveland delivery 1.05c is a common quotation and 1.07½c has been named. Pittsburg mills are generally firm at 1c mill. We continue to quote bar iron at 1 05c, Cleveland, out of stock. The 2,500 tons of plates and shapes for the Cleveland Shipbuliding Co.'s new steel boat were divided, the plates going to Cleveland and the shapes to Pittsburg. Plate mills are still crowded and as a rule anything like early shipment is very difficult. We quote beams and channels at 1.28½c; No. 28 sheets at 2.10c to 2 12½c; tank plates at 1 20c. Pipes and tubes are strong, particularly on early delivery. Boiler tube manufacturers made no advance last week, but are firmly holding prices A meeting of wire and wire nail manufacturers held in Chicago Sept. 15 decided to advance prices 10 cents, and wire nails are now quoted $1.35, Cleveland; smooth wire, $1.25.

OLD MATERIAL.—The market has not responded to the general improvement to the extent that dealers desired. The firmest price on the list is for old iron rails, which are on a valley basis of $13.75 to $14. We quote wrought scrap at $10 50 to $11; busheling scrap at $8.75 to $9; old car wheels at $10.75; old steel rails at $10.25 to $10.50.

CINCINNATI.

Sept. 20.

The heavy demand in Birmingham for iron for export mentioned last week has had the expected result of advancing prices. The largest producer in the Birmingham disctrict made an advance on all grades Monday. This will put No. 2 foundry on the basis of $7.75 cash, Birmingham. The advance is not likely to stimulate buying. There is a little trade all the time and some 500 ton lots have been sold, but there is no heavy purchasing. Nearly all the large consumers are pretty well filled up. In fact most of them have anticipated their wants up to the end of the year at least, and the only buying to be expected now is of the hand-to-mouth variety. On this full prices are reported. Shipments continue large, with more soft iron being called for than the Southern furnaces can supply on time. The largest Southern producing company has on its books now orders for over 300,000 tons. Most of the other furnaces are correspondingly provided with orders. There is an increased activity in the demand for Northern foundry irons. There seems to be no element of weakness anywhere; but on the other hand, the outlook is unusually promising for an active fall and winter business. We quote for cash f. o. b. Cincinnati: Southern coke No. 1 foundry, $10.25; No. 2, $9.75 to $10; No. 3, $9.25 to $9.50; No. 4 and gray forge, $8.75; mottled, $8.75; No. 1 soft, $10 to $10.25; No. 2, soft, $9 75; Tennessee charcoal, No. 1, $12.50 to $13; Hanging Rock charcoal, No. 1, $14.50 to $15.50; Jackson Co., silvery, No. 1, $12 to $12.50; standard Georgia car wheel, $14.25 to $15.

THE TIN PLATE MARKET.

The most interesting feature in the business at the present moment is the consolidation movement promoted by Judge Moore, of Chicago. It is reported that the committee has sufficient financial strength behind it to pay all cash upon all of the options of purchase they hold upon the various mills; but it is generally supposed that the mills will be expected to take stock for the larger part of their selling price. Nothing official has been given out during the past week, but it is understood that options covering between 80 and 90 per cent of the output of the country have been secured, and it is generally believed that the consolidation is in a fair way to succeed. The trade generally is not opposed to the plan, but it is not being rushed into an unusual or excessive purchase by the prospect of an advance in prices. The weakest feature of the whole situation is the fact that some of the largest mills are eagerly taking every order in sight for deliveries any time next year at prices 5c to 10c under the prices for earlier deliveries. This does not indicate great faith in the final consummation of the consolidation, because prices on far future should be considerably higher than deliveries over the present year—owing to the avdanced price of steel billets and the probability that billets will still be higher up to Jan. 1. We quote 100 pound cokes f. o. b. mill: September to December, $2.62½ to $2.65; January to July, $2.57½ to $2.60.

THE Chisholm & Moore Mfg. Co., Cleveland, has now occupied for about a month its new plant at the corner of Lake and Kirtland sts. It has been well employed for some months and increased its force on going into the new works. The demand for the company's differential chain hoists has kept up steadily. A successful development of the business is an electrically driven hoist, employing the Elwell-Parker Electric Co. motor It has been perfected recently and two of the hoists are in use by the Forest City Steel & Iron Co. Loads of from three to 10 tons are handled rapidly and economically. This is the first advance made by the company from hand-power hoists, and promises to become an important feature of its business. The difficutlty experienced at the outset with the controller has been met so as to make abuse of the apparatus by careless application of full power impossible.

THE IRON TRADE REVIEW
AND
INDUSTRIAL WORLD.

DEVOTED TO MACHINERY, METAL-WORKING AND FOUNDRY TRADES AND IRON AND STEEL MANUFACTURE.

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THE VALLEY FURNACEMEN'S PROBLEM.

The question now before the operators of the 18 Mahoning and Shenango valley furnaces included in the agreement on Bessemer iron is not so much one of price, as of ways and means, in view of recent developments. A plan of restricted prodouction is a partial solution; but the loss of customers, thus far, through the building of blast furnaces, together with the greater losses impending, from the same cause, leaves more extra furnace capacity than any ordinary curtailment scheme could meet. If the Federal Steel Co. shall carry out at once the tentative plan of the Lorain Steel Co. for four blast furnaces instead of two, the expectation that the Lorain plant would still be a buyer of 500 to 1,000 tons of iron a day would come to naught. And under the arrangement now being made, by which hot metal will be taken from the furnaces of the Youngstown Steel Co. and the Brier Hill Iron & Coal Co. to the Ohio Steel Co.'s plant, the latter company will practically be out of the market after its two furnaces now building are completed. Thus, instead of expecting the two Northern Ohio steel companies to buy part of their metal in the open market for two or three years to come, the merchant furnacemen are preparing for the worst. A steel works project is under consideration and the proposition is being seriously canvassed. The necessity of taking direct metal, to attain the lowest cost, and the impossibility of locating a plant so that hot iron could be taken conveniently from a sufficient number of furnaces, present a problem on which agreement will be difficult. However, the amount of capital invested in valley furnaces of modern type argues strongly for the final success of the efforts now being made to find a way out. The steel plant as a partial solution means that the surplus would be carried one step farther toward the finished form, and that whatever slack time there might be, due to overproduction, would eventually be distributed among steel works, instead of falling altogether upon furnaces.

JULY EXPORTS OF IRON AND STEEL.

The new fiscal year started well for the growing American export trade in iron and steel. It is a year since the new and better classifications in these products were first employed by the Bureau of Statistics, and it will now be possible, month by month, to make more intelligent comparisons, and to note with more precision the lines on which the outward movement is making most progress. The tonnage of the products included in our table below was greater by 67 per cent in July, 1898, than in July, 1897. Steel rails account for 20,000 tons of the increase, but there are notable gains also in other important lines. Of the 34,000 tons of steel rails, 13,000 tons went to British North America, 9,818 tons to Europe, 1,398 tons to Mexico, 1,233 tons to the West Indies, 3,383 tons to South America, 1,404 tons to Japan, 2,505 tons to Asia and 1,238 tons to Africa:

EXPORTS OF IRON AND STEEL FROM THE UNITED STATES—GROSS TONS.

	July.		January—July.	
	1897.	1898.	1897.	1898.
Pig iron { ferro	1,489	148	1,489	3,366
Pig iron { all other	14,532	11,904	136,441	104,777
Scrap	7,154	6,066	22,745	39,383
Bar iron	324	412	2,668	3,032
Steel bars (not wire rods)	1,217	2,019	35,191	43,179
Iron rails	300	1	4,393	1,339
Steel rails	14,529	34,134	67,112	173,692
Billets, ingots and blooms	754	4,951	*754	14,695
Hoop, band and scroll iron	39	36	360	430
Wire rods	1,921	606	*1,921	4,520
Iron sheets and plates	437	319	1,845	1,763
Steel sheets and plates	324	4,448	1,334	12,599
Tin plates, terne plates, and tagger's tin	.....	1	.....	1
Structural material	1,026	3,802	*1,026	19,316
Wire	3,615	7,340	29,623	41,340
Cut nails	247	3,267	1,905	9,265
Wire nails	876	1,960	876	6,367
Other, including tacks	183	112	2,544	1,130
	48,977	81,446	311,408	438,602

(*) Not separately stated prior to July, 1897.

Exports of machinery also show good gains over July, 1897. The total value of all iron and steel exports, including machinery, in July was $7,012,977, as compared with $4,918,107 in July, 1897. For the seven-months periods ending July 31, the total was $45,000,000 for 1898, $35,000,000 for 1897 and $25,000,000 for 1896, the advance being by ten-million-dollar stages.

POSITION OF THE PITTSBURG DISTRICT.

The position of Allegheny County in the statistics of iron and steel production for 1897 is interesting in view of the prominence given in the past two years to plans of producers there for strengthening their position. The detailed statement of output in various lines for 1897 and the two preceding years is thus given in the report of the American Iron and Steel Association issued the past week:

	1895	1896	1897
Production of pig iron	2,054,585	2,061,269	2,665,085
Production of Bessemer steel	1,486 811	1,608,321	2,061,837
Production of open-hearth steel	481 030	569 680	721,261
Production of crucible and other steel	39,123	33,596	43,231
Total production of steel	2,406,964	2,211,597	2,827,330
Production of rails, bars, bolts, rods, shapes, hoops, skelp, etc	1,462,623	1,350,886	1,797,061
Production of plates and sheets	350,593	324,296	395,830
Total production of rolled iron and steel	2,813 216	1,675,182	2,191,891

The conspicuous additions made in 1896 and 1897 to the blast furnace capacity of Allegheny County have made themselves felt to a marked degree in the statistical exhibits. Last year's pig iron output in Allegheny County was nearly 1,000,000 tons above that of 1894, only three years previous. Bessemer and open-hearth steel and rolled products of all descriptions also made notable gains. But the question of the gain relative to the total output is

even more interesting, in view of the competition of other districts and the extensions they have in plan and under way. The table below shows the percentages of the country's production in various lines contributed by Allegheny County:

	1897	1896	1895
Pig iron	27	23	22
Bessemer ingots	37	41	38
Open-hearth ingots	45	43	42
Crucible steel	60	55	58
Steel rails	32	27	...
Structural shapes	63	66	...
Plates and sheets	33	33	...
Total rolled products	31	30	29

The greater expansion in Bessemer steel production in other districts is in evidence in these figures, as is the enlargement of Pittsburg's open-hearth capacity. The concentration of steel rail production in the Pittsburg and Chicago districts is a matter of common knowledge. The table shows Pittsburg's share of this. The very slight gain each year in the percentage of total rolled products is an instructive commentary on the splendid expansion of the country's consumption of finished steel. Since it is well known that Pittsburg has been steadily increasing her rolling capacity, it follows that this has been true also to almost the same extent, of the rest of the country.

In view of the plans of expansion made by the Federal Steel Co., and the increase in blast furnace and Bessemer steel works capacity under way in Ohio, and in open-hearth capacity in Alabama, it will be interesting to note the changes that may appear in the above tables, when the columns for 1899 come to be added. The probabilities for 1898 are that the record of 1897 will be quite outdone.

IRON AND STEEL PRODUCTION IN 1897.

The annual statistical report of the American Iron and Steel Association for 1897 has just been issued in pamphlet form under date of Sept. 10. We have given some of the advance statistical tables, as they have been published from time to time in the *Bulletin*. The most comprehensive statement in the report is that contained in the following table:

Articles—Gross tons, except coke and nails.	1896.	1897.
Shipments of iron ore from Lake Superior	9,934,828	13,469,638
Shipments of Connellsville coke, in net tons	5,411,602	6,915,052
Production of pig iron, including spiegel and ferro	8,623,127	9,652,680
Production of spiegeleisen and ferro-manganese	131,940	173,695
Production of Bessemer steel ingots	3,919,906	5,477,315
Production of open hearth steel ingots and castings	1,292,700	1,608,671
Production of all kinds of steel	5,281,689	7,156,957
Production of structural shapes, not includ'g plates	495,571	583,790
Production of plates and sheets, except nail plate	965,776	1,207,286
Production of all rolled iron and steel, except rails	4,393,831	5,353,836
Production of Bessemer steel rails	1,116,958	1,644,520
Production of all kinds of rails	1,122,010	1,647,892
Production of iron and steel wire rods	623,986	970,736
Production of street rails, included above	145,210	122,244
Production of all roll'd iron and steel, incl'd'g rails	5,515,841	7,001,728
Production of iron and steel cut nails, in kegs	1,615,870	2,106,799
Production of iron and steel wire nails, in kegs	4,719,860	8,997,245

The detailed statements of pig iron, Bessemer and open-hearth steel and steel rail production we have already given. The last named showed a total of 1,645,020 tons, the largest since 1890, when the total was 1,871,425 tons. The table of production of structural shapes, which excludes plate girders made from plates, shows that Ohio has dropped from 18,417 tons in 1895 and 18,161 tons 1896, to 13,629 tons in 1897. The total for 1897, 583,790 gross tons, is an increase of 88,219 tons, or over 17 per cent over 1896. The total in 1895 was 517,920 tons; in 1894 it was 360,305. The production by States in 1896 and 1897 was as follows:

States—Gross tons.	1896.	1897.
New England, New York, and New Jersey	17,753	20,785
Pennsylvania	446,216	538,055
Kentucky, Tennessee, and Alabama	1,892	2,384
Ohio	18,161	13,629
Illinois, Wisconsin, and Minnesota	7,020	.....
Colorado and California	4,499	8,937
Total	495,571	583,790

The production of plate and sheet iron in the United States in 1897, excluding nail plate, amounted to 1,207,286 gross tons, against 965,776 tons in 1896, 991,459 tons in 1895, 682,900 tons in 1894, 674,345 tons in 1893, and 751,460 tons in 1892. Skelp iron and steel are not included. The total production of plates up to No. 8 inclusive was 597,549 tons, against 458,136 in 1896 and 508,343 in 1895.

The production of iron and steel wire rods in the United States in 1897 amounted to 970,736 gross tons, against 623,986 tons in 1896 and 791,130 tons in 1895, showing an increase of 346,750 tons, or over 55 per cent over 1896 and 179,606 tons over 1895. The following table gives the production for three years:

States—Gross tons.	1895.	1896.	1897.
New England and New York	91,513	63,808	94,471
New Jersey	22,290	15,925	
Pennsylvania	278,406	333,352	351,676
Ohio	210,058	146,329	265,317
Indiana and Illinois	188,863	164,572	259,272
Total	761,130	623,986	970,736
Iron	2,840	2,473	2,019
Steel	788,290	621,513	968,717

We still import considerable quantities of the finer grades of iron and steel wire rods, particularly steel wire rods, our total imports amounting to 16 415 gross tons in 1897 and to 18,977 tons in 1896, the imports coming chiefly from Sweden and Norway. There was a prodigious increase over 1896 in the production of iron and steel wire nails, the total being 8.997.245 kegs of 100 pounds each, against 4,719.860 in 1896, a gain of 90 per cent. Last year's output represents 401,663 gross tons, indicating how important a factor in billet consumption the wire nail mills have become. Pennsylvania produced 3.467,509 kegs of wire nails in 1897, against only 1.579,946 in 1896. Ohio also more than doubled—2,237,641 kegs against 907,943. Illinois made 1.993.547 kegs, against 1,050,237 in 1896.

The cut nail and cut spike production increased in a surprising way last year, after a steady decline since 1886. The total for 1897 was 2,106,799 kegs, against 1,615.870 in 1896, 2,129,894 in 1895; 2,425,060 in 1894. 3,048,933 in 1893, and 4,507.819 in 1892.

The figures for the production of rolled products in 1897 are impressive. They include iron and steel rails; plates and sheets; nail plate; wire rods; bar, belt, hoop and skelp iron and steel, and rolled axles. Muck bars, billets and sheet and tin plate bars are not included. The total in 1897 was 7,001,728 gross tons, against 5,515 841 tons in 1896, an increase of 1,485,887 tons, or nearly 27 per cent. The total in 1895 was 6,189,574 tons. Pennsylvania made 56.5 per cent of the total production of rolled iron and steel in 1897, against 56.8 per cent in 1896; Ohio made 14.5 per cent in 1897, against 13 9 per cent in 1896; Illinois made 12.3 per cent in 1897, against 10.7 per cent in 1896; and Indiana made 3.6 per cent in 1897, against 3.5 per cent in 1896.

An attachment suit was brought in a Cleveland court last week by employes of the United States Wire & Nail Co., which operates a small plant in Cleveland. Wages amounting to $3.700 were unpaid and the property of the company was levied upon. On Monday, Sept. 19, three other suits were filed. The plaintiffs were Grief Bros. Co., with a claim of $1,554.50; Naylor & Co., with a claim of $4,796.73, and the Grasselli Chemical Co., whose claim is $967.25. The United States Wire & Nail Co. is operated by the Biddle Purchasing Co., of Philadelphia. Clement H. Biddle is the general manager of the Cleveland mills. Mills are operated by the same company in other cities. The Cleveland plant has employed about 175 men.

W. S. Rockwell & Co., the New York furnace engineers, have just installed at the Joseph Bancroft & Sons Co.'s works, Wilmington, Del., a five-plate oil singeing furnace and their improved duplex system for burning fuel oil. This is considered the most complete and modern singeing plant in the country.

Buena Vista Furnace, at Buena Vista, Va., now under the management of Frank F. Amsden, is averaging 170 tons of basic iron a day, as compared with 130 tons a day a month ago.

The Falls Rivet & Machine Co., of Cuyahoga Falls, O., has just received a Government contract for 100,000 3-pound shells for navy rapid-fire guns. Delivery begins Nov. 1 and will be at the rate of 10,000 shells a month.

THE MACHINERY TRADE.

OPINIONS OF MANUFACTURERS AS TO THE OUTLOOK AT HOME AND ABROAD.

Inquiries were addressed recently by *The Iron Trade Review* to machinery manufacturers in various lines relative to the latest developments in business conditions and in national policy. The replies indicate that both domestic and foreign business in machinery is of large proportions, and that now that the Cuba question has ceased to be a suspended sword, threatening business and deterring new enterprise, there is every indication that a period of expanding trade is ahead. The inquiries were in these terms:

1. With the handicaps and uncertainties of the past few years out of the way, is the machinery trade finding signs of improvement and in what directions?

2. Is the export business in American machinery growing satisfactorily? Are foreign reproductions and adaptations interfering? In the period of larger domestic prosperity on which we are entering, is the export trade apt to be neglected for more profitable home trade?

3. What expansion of our foreign machinery trade should our manufacturers prepare for, in view of the results of the war?

Below are some of the replies which have been received thus far:

Hill, Clarke & Co., Chicago.

The machinery trade through the Central and Western States shows decided signs of improvement and this is not confined to any one line of manufacturing, but is general. With the uncertainties of the past few years out of the way, we think that the country will be in condition to enjoy from six to 10 years of good business in the machinery line without interruption.

The last two questions we are not in position to speak upon, as we do nothing whatever with foreign trade, that being looked after by our main office, in Boston.

Brainard Milling Machine Co., Hyde Park, Mass.

We see a few signs of improvement in the machinery trade in this country, and prices as a rule are so low that margins are trifling. The export business in American machinery shows a healthy growth, and at this time is a great help to our machinery builders. Foreign reproductions and adaptations do interfere to a certain extent, and will probably continue to do so to an even larger extent. We do not think that increasing domestic prosperity will lead manufacturers to neglect the export trade. Foreign agents would be taken care of on the same basis as home agents. To the third question, we see no reason to expect anything more than a gradual expansion of our foreign machinery trade.

Jones & Lamson Machine Co., Springfield, Vt.

We believe that every indication is favorable to a large domestic machinery trade, and a foreign trade even greater than that now existing. Foreign copies of American machinery will be very much like the American copies, lacking in some essential and vital points. Copies are usually made about the time that the originating company are making sweeping and radical improvements, so that the copyist is generally making an inferior machine. Aggressive activity on the part of the American will certainly insure a maintenance of his present leading position in the race for a few years.

The omnibus qualities of most all the machine builders to make room for one more order will take care of a very large increase of business and will hold our foreign orders.

We do not at present see any indication of an increase in foreign orders for our class of machinery, resulting from the war with Spain.

Newark Machine Tool Works, Newark, N. J.

1. There are signs of improved conditions in the machine business, in local shops. The electric concerns and shops turning out new lines are fairly busy.

2. The export business is growing nicely. The foreigners are copying our designs and making great preparations to do this business for themselves. To keep the foreign trade, our builders must keep the foreigner copying.

3. It seems to us that the entire West Indian machine trade should come to the United States now.

Pratt & Whitney Co., Hartford, Conn.

We observe some indications of an improvement in lines of manufacture in the United States that will be favorable to our business. Our exportations have been satisfactory and we are not aware that foreign reproductions and adaptations of our tools have had any more effect upon our orders than they have had for 20 years past. We do not anticipate any difficulty during the coming 12 months in taking care of both foreign and domestic business.

We look for little or no expansion of trade in our productions in Spanish speaking countries.

Bickford Drill & Tool Co., Cincinnati.

The machinery trade of this year and of the greater part of last year, has been in excellent condition, as far as our shop is concerned. We have been exceptionally busy and now have enough orders to run us into the new year. The development of this business is from both foreign and domestic sources, with the domestic business improving steadily. The export business has been growing right along, and there seems to be no let up of these orders. In our line, similar machines, in fact absolute copies, have been made by English and German tool builders, but so far we have not felt any effects of their competition. We hardly think that any manufacturer could afford, even after business in this country gets back to its regular standard, to neglect the export trade but would rather increase to provide for both.

The Lodge & Shipley Machine Tool Co., Cincinnati.

1. The machinery trade is finding signs of improvement from the domestic user, North, East, South and West.

2. The export business, so far as we are concerned, is growing satisfactorily. Our output for this year has been shipped to foreign countries to the extent of about 35 per cent and is growing very nicely. Foreign reproductions and adaptations up to date have not appeared, i. e., so far as our own particular line is concerned. We shall endeavor to cultivate and keep our foreign trade but we doubt if either ourselves or any one would be willing to do this at much loss or, in other words, if prices advance sufficiently in this country and the foreign trade are not willing to pay the advance, we doubt seriously as to their getting the preference. Yet we have some very valued customers that we should be very loath to lose and would no doubt make such arrangements as would be satisfactory to both parties.

3. In answering this question, it would be the writer's opinion that we should cross the bridge when we come to it. There are few manufacturers in the United States receiving large orders who will not make provision to take care of them as the demand shows up.

The Webster & Perks Tool Co., Springfield, O.

For the most part we are unable to give a full reply to your questions as the result of actual experience, as we have largely catered to our home or domestic trade. This, we are pleased to say, has given us in the past all that we had capacity to do; and from present indications, we have every reason to believe that there will be even quite an increase, here in this country, not only in the machine tool line, but in all manufactures, over what we have experienced in the past two years. While we manufacture a line of machinery that is applicable to both home and foreign trade, we make a specialty of special machinery, tools, etc., which trade is necessarily to be found here at home. While we have enjoyed some foreign trade, and will continue to take care of what comes our way in the future, we shall at the same time put forth our best efforts in providing for the trade of this country.

Springfield Machine Tool Co., Springfield, O.

We have known of no handicaps or uncertainties in the machinery trade, for the past few years, as the machine trade has been good and cannot be much improved on.

The export business on American machinery has also been satisfactory, but as to its increase, we have not noticed any for some time, but believe that the trade will remain very steady and regular, on well established lines. We hear nothing of foreign reproductions and adaptations interfering with the American trade.

Should there be larger domestic prosperity, it might to a certain extent, cause the export trade to be neglected, but it

would depend entirely on the profits, which one or the other gives to the manufacturer. The one giving the best profit s the one that will be favored.

Cleveland Machine Screw Co., Cleveland.

From present indications the times bid fair to bring forth a new era in the machinery trade. We are at present far behind in our orders, which, with the new orders still coming, compel us to operate our plant night and day to meet the demand.

We have in the past, and are at present enjoying a very pleasant foreign trade, the demands from that section being such that we opened a foreign branch at Birmingham, Eng., some months ago. While the trade in both our own and foreign countries seems to be growing, we will endeavor to meet the demands of each in turn.

We are hardly in a position at this early date to express our opinion as to the result of the war upon the machinery trade in the foreign market, but we hope to see a continuance of the present healthy condition.

The American Tool Works Co., Cincinnati.

1. Since the close of the war, we have found a decided improvement in our domestic trade, not from any particular section, but the improvement seems to be general. We do not expect any boom this year, but we think from now on there will be a steady increase in orders for machine tools from this country.

2. Our export business is entirely satisfactory, being much larger this year than in any previous year. It is impossible for us to supply our foreign trade. We think this trade has come to stay and while it may decrease some within the next few years, yet it is our opinion that we will always have a good demand for machine tools from the prinicipal European countries.

3. Now that the war between Spain and Cuba and the United States and Spain has come to an end, there is no doubt that manufacturing will be renewed in Cuba, and that there will be some demand for machine tools, although we do not expect anything very large from that country, owing to the limited number of manufacturers, and the little necessity of machine shops. We also expect to receive some orders from Hawaii Islands as well as the Philippines. We should think manufacturers of wood working and sugar refining machinery and kindred lines would do a very heavy business in these countries.

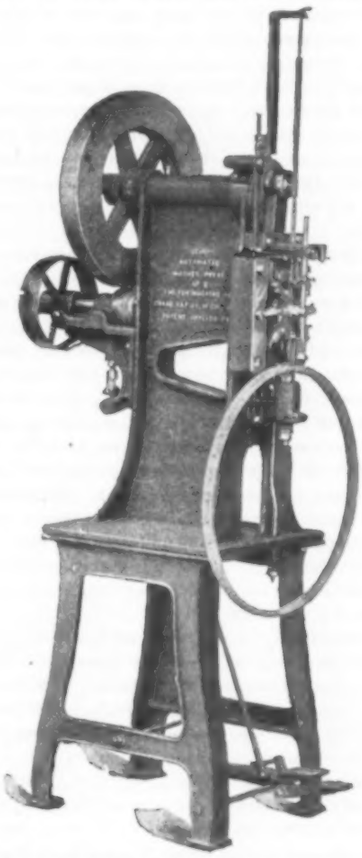
FOX WASHER PRESS.

The sharp competition in the bicycle business has made it necessary to bring out tools which will cut the cost of production down to the lowest possible figure, and it is in this direction that the energies of tool designers has been directed in the past two years. One of the results of such effort is shown in the Fox washer press designed and manufactured by the Fox Machine Co., of Grand Rapids, Mich. Probably no single article of recent production has come into any more extensive use than the nipple washer and the furniture caster track plate from which it was developed. In 1885 Julius Berkey and W. R. Fox jointly took out a patent for a steel socket for furniture casters, together with a track plate, the purpose of which was to sustain the socket as the nipple washer sustains the bicycle nipple. The teeth being drawn into the end of a chair leg or the bottom of a piece of furniture prevented it from splitting, as the nipple washer does in the case of the bicycle rim.

The superiority of the Fox washer is in the fact that the depression which forms the countersink for the nipple is made before the center hole is punched. This insures solid metal around the hole. Where the hole is first punched and the depression formed afterwards there is a stretching of the metal away from the hole, leaving it weak where it should be the strongest. The Fox method insures the wheel standing up after being trued, as the rim texture of the washer will not allow the nipple to settle and throw the wheel out. Another feature of the Fox washer is that the teeth are drawn so that they come to a sharp point, making them penetrate the wood and giving them special holding qualities.

After two years of experimenting on machinery for inserting washers and after having machines in actual use for over a year, the Fox Machine Co. adopted the form of press known as the No. 6 automatic. The power is applied to the main shaft through the friction, which is at all times under the control of the operator, by means of the foot treadle. The washers are furnished to the consumer strung on wires carrying 500 washers; these are all strung with the teeth standing in one direction, so that when they are threaded upon the feeding wire of the press they are ready for delivery to rim.

The feeding wire, as shown at the top of the machine, passes down through a shuttle, the end of the wire terminating just over the pilot pin of the turret. As the slide with the turret ascends, the shuttle is opened and the washer drops on to the pilot pin. With the descent of the slide, the turret is revolved one-sixta of a revolution, the retaining finger drops by gravity over the pilot pin and holds the washer in position. The rim is placed upon the bearing shoe, which is made adjustable for different thicknesses of rims and is supported by a spring, the rension of which can be regulated anywhere



from 100 to 800 pounds according to the pressure with which it is desired to force the washer into the rim. The operator places the rim on the shoe with a hole directly under the pilot pin. As the slide descends the retaining finger is moved to one side just as the pilot pin enters the hole in the rim, the washer drops into the countersink and the plunger in the turret sets it firmly in the rim.

The turret is revolved as it ascends and comes in position for the next insertion. In the meantime the operator moves the rim along the position of one hole, moving the bottom of the rim first in and then out from a perpendicular line. The pilot pin in the turret as it strikes the hole guides the rim to the proper position to make the washer stand square with the drilling.

It does not require a skilled operator to string the washers upon the feeding wire or to move the rim so that it comes in position for receiving them. A boy will soon learn this so that washers can be put in at the rate of 70 a minute. This is equal to 42,000 in 10 hours or about 1,400 rims, bringing the cost of inserting washers down to the lowest possible figure, in some instances as low as one and a half cents per thousand washers. This machine, which is shown in the accompanying illustration, has been doing service the past year.

THE Spaulding Machine Screw Co., Buffalo, went into a receiver's hands April 16. Its product was bicycle parts. The assets are $150,000 and the liabilities $200,000.

MESABI ORE RATE HEARING.

The second Cleveland session of the Minnesota railroad commission, to take the testimony of iron ore sales agents and of furnace men concerning the iron ore freight rate in Minnesota was held on September 14. The testimony in the main tended to support the contention of the railroads that a reduction of freights would lower the price of ore to the consumer, and that consumption would not be increased. James Corrigan, of Corrigan, McKinney & Co., who is interested in the Commodore mine, was a witness on the complainants' side. He went into the relations between himself and the Rockefeller interests. He pointed out that the profit on ores sold by the two large companies on the Mesabi range came not from mining but from transportation, and combated the proposition that a reduction in the ore freight from the mine to dock would be followed by a reduction to the consumer. He considered that ore prices were now so low that the railroad-owning companies would not reduce them further, and that the price remaining stationary, while the freight was decreased, would give the independent producer the desired margin. He cited the fact that the rail rate reductions on the Gogebic and other ranges the past year had not resulted in corresponding reductions in the price of ore, the latter being higher this year than last. But this was answered on the other side by the statement that the ores in question were of Bessemer quality and prices were fixed by an association. Mr. Corrigan held that the rates of the Minnesota roads were excessive. He compared them with a haul of 80 miles on the Menominee range, on which his firm paid 45 cents and one of 65 miles on which it paid 40 cents.

F. A. Bates, of Drake, Bates & Co., who has been identified with the Hale and Cincinnati mines, was also called as a witness for the complainants. He thought no mine owner on the Mesabi could live unless he had an ore of exceptional quality. On an 80-cent freight, Fayal ore costs 15 cents more than it sells for, the Minnesota Iron Co. making on its rail haul what it loses on mining, while an independent mine owner in the same situation, would mine at an actual loss. Under this situation nobody, apart from the big companies, cared to buy mines. He admitted that the Carnegie Steel Co.'s cost set the pace and that other consumers must have ore on practically the same basis.

Witnesses for the defense, who were cross-examined by Attorney Billson, were asked if the operations by furnace companies on the old ranges in the past 15 years, and more recently the entrance of the Carnegie Co. upon the Gogebic range had made mining on those ranges unprofitable for others. He was answered in the negative, and the opinion was given that railroad and mining operations as carried on in conjunction on the Mesabi range were responsible for the sharp competition there.

Harvey H. Brown, of the Stewart Iron Co., gave testimony similar to that reported in our last issue, as to the limitation on the use of Mesabi ores, the inducement already existing for the use of as large percentages as possible, in their low cost, and the fact that prices were fixed largely by the cost of ores to producing-consuming interests.

W. G. Mather, as an officer of the Lake Superior & Ishpeming Road, said that his company disposed of its bonds only by guaranteeing that a sinking fund would be established that would retire the entire bond issue in 25 years and also provide for replacement of equipment, docks, etc. The low operating cost of the Duluth, Mesabi & Northern was attributed to the lack of such sinking fund provision. It was shown that the Lake Superior & Ishpeming Road's ton-mile rate was greater than that of the Minnesota roads.

Robert Bentley, general manager of the Ohio Iron & Steel Co., operating a furnace at Lowellville, O., testified that he had used as high as 70 per cent of Mesabi ore and would use all he could, as it was the greatest factor in cheapening costs, but he had reduced to five-sixteenths of Mesabi, which was as large a percentage as he considered safe. He had bought non-Besssemer ores this year at 25 cents less than last, because of lessened freights. The supply exceeded the demand and this would always reduce prices. No steel maker could exist, he said, unless he could get ores at the same cost as the most-favored competitors, therefore the Carnegie cost regulated the entire production of ores. Export trade, he said, was the future for the steel trade, and to hold export trade, costs must be kept down. He believed a period had arrived in this country when small profits and great volume of business must be considered as governing the situation. To show how reductions were given to consumers, he stated that the very day the Carnegie road announced its low rates all other roads between Lake Erie and the furnaces had to do exactly as well.

From Cleveland the commissioners went to Chicago, traveling in a private car of Duluth & Iron Range Railroad officials. The testimony is very voluminous, seven stenographers having been employed in the hearing, working in relays, so that the work of transcribing might keep well up with the hearing. The hearing is now practically completed and the mass of evidence remains to be sifted preparatory to the giving of an opinion. The questions at issue have been gone into very thoroughly, the intention of the defendants evidently being to give the agitation for rate reduction its quietus, if this could be done by massing all the facts in the Mesabi problem. The decision will probably be delayed for some time.

Westinghouse-Walker Co. Consolidation.

Another consolidation is announced—that of the Westinghouse Electric & Mfg. Co., of Pittsburg, and the Walker Co., of Cleveland. The latter, which originally made a specialty of heavy gears and of cable railway equipment, has had in the past few years some large electric machinery contracts, having a business of about $2,000,000 a year. The Walker Co. is now making for Boston the largest generator in the world; it recently sent equipment for 500 street cars to Paris; it equipped the Brooklyn Elevated Railway, it furnished equipment for Liverpool, Eng., and has been taking orders all over the world. Sidney H. Short, vice-president of the company, is its electrical expert and under his management the concern, which before was losing money on a small business, has been earning a profit and rapidly extending its business, which reached $2,000,000 last year, half of it being for export. The names and organization of the two companies are to remain as heretofore, except that three of the Westinghouse directors retire to make place for J. W. Hinckley, of New York, president of the Walker Co., Roswell P. Flower and Anthony N. Brady. Sidney H. Short continues to be vice-president of the Walker Co and F. W. Ferguson, secretary. The capital stock of the Walker Co. is $2,500,000, with $2,500,000 bonds.

The Walker Co. has won some of the patent infringement suits brought against it by the General Electric Co. and has become an increasingly important factor in the field of large electrical construction. The understanding as to the interchange of patents between the Westinghouse and the General Electric Co. will now doubtless cause some advance in prices, as the Walker Co. has been a sharp competitor. It is announced that additional buildings will be erected at the Walker plant, on adjoining land now owned by J. B. Perkins, the founder of the original Walker Mfg. Co.

Personal.

The name of E. H. Putnam appears at the head of the editorial columns of the September *Foundry*, as associate editor. As a vice-president of the American Foundrymen's Association, a contributor to its proceedings and as editor of the foundry department of the Chattanooga *Tradesman*, Mr. Putnam has become a factor in the world of foundry literature, and a wide circle of friends will wish him success in the new field.

Horace V. Winchell has accepted the position of geologist for the Anaconda Copper Mining Co., at Butte, Mont.

Jeremiah Head & Son, of London, Eng., have been appointed consulting engineers to the Alberta Irrigation Co., of London, and of Lethbridge, in Western Canada. This will involve annual visits to the latter locality, and periodic reports upon the extensive irrigation works now in progress.

THE Becker Name Plate Co., 34 Oliver st., Boston, is sending out an aluminum letter opener and paper cutter to the trades covered by its operations. The company also designs and engraves and is a manufacturer of embossing dies. Its souvenir bears a neat sample of name-plate designing.

Review of the Technical Press.

[Translation, Condensation and Comment expressly for The Iron Trade Review by Dr. Richard Moldenke.]

By-Product Plants for Coke Ovens.—*Stahl und Eisen*, Aug. 15th, contains an article on the above subject by Rudolf Terhaerst, chief engineer of the Cologne Machinery Co. While it is essential in the production of coke for blast furnace and foundry purposes, that a certain degree of hardness and resistance to pressure be attained, and that fuel free from flaming and smoky constituents, together with a reasonable purity may result from the process employed; yet the old idea that this can only be done in the beehive ovens has finally yielded to the modern view which upholds processes in which the waste products are recovered and utilized. While this may be the case in Europe, it is still an open question here, at least so far as the production of anything equal to the Connellsville coke is concerned. It is doubtless true that the prevalent idea that a drawing off of the waste gases will diminish the value of the product is founded upon some costly experiences, but where good judgment is exercised the coke is left in an excellent condition for metallurgical purposes. In addition to this the purified gases answer all the purposes for coking, and a surplus is left for firing boilers. The choice of the oven is of great importance, for the mode of distillation seriously affects the quality of the coke both as to weight and appearance. The distillation should be a gradual one, and the temperature should not be too high, otherwise the coke will be too porous and the tarry products reduced in value, the latter being caused by a molecular grouping of the by-products quite different from that most desired. Tar formed at high temperatures contains more benzol and toluol, as well as napthaline, and other solid bodies. When the temperature is lower and the distillation slower, the volatile carbo-hydrates predominate. Great care must be taken to have the exhaust regulated to a nicety, so that no disturbance is created in the ovens from an over pressure, which forces the valuable gas through the chinks of the brickwork, thus causing loss; while too strong a suction gives rise to another series of evils. To obtain the best results the coal should be thoroughly wetted down before charging; the absorption of the heat by the watery vapor thus formed causes the rise in temperature to be more gradual. Dry coal and rapid gasification loosens up the coal too much and carries some of it along. The author deprecates the use of water seals which are calculated to prevent the loss of gases backward into the oven when it is opened, on the ground that an extra resistance is introduced which prevents a free disengagement of the gases from the coal. He advises the use of a dry chamber running over about 30 ovens, into which the gases should enter, cool, and deposit their tarry matter in a serviceable condition for further use. Suitable provisions are made for preventing the air from entering the off-takes when the oven is emptied. At the upper end of the off-takes to the main, doors are hung which act as safety valves in case of a suddenly arising excessive pressure. The main gas flue which takes care of 60 ovens has a slight fall and enters a cooling chamber. The condensable products of distillation are taken off at the ends of the batteries of ovens. An exhaust system carries the gases through the flue containing diaphragms acting in the nature of a dry scrubber. A by-pass regulates the gas and prevents over as well as under pressures. The main is made to change its direction several times, and in this way helps to separate the tar more readily. It is of vital importance to cool the gas as rapidly, and yet let it move as slowly, as possible. The ordinary gas scrubber composed of stacks of wet boards answers best. It has been found that the plainer this apparatus is, the better. Repeated use of the water for washing raises its ammonia contents. It is advisable to cool the water as it comes out of the scrubber before using it again. The gases now free from ammonia are treated for benzol. This is done by bringing them into contact with finely divided sprays of cold coal oil. The benzol is readily absorbed, and is recovered again by fractional distillation. The oil residue is used over again. The gases now pass through a regulator, part of them going to the ovens for heating purposes, and the balance under the boilers. The tar obtained in the first part of the process is distilled carefully, a pitch remaining behind, which in Europe is used as a binding medium for making briquettes out of coal dust. The ammonia water which runs about 1.2 per cent in strength is thoroughly mixed and heated by means of steam jets. Milk of lime is fed in at the same time, liberating the ammonia vapor, which is carried into sulphuric acid, forming sulphate of ammonia. The author concludes with pointing out that a slow, careful distillation does not injure the coke from a metallurgical standpoint; in fact it is said to be made much better than quickly made coke from the ordinary process.

Chill Roll Progress. [*American Manufacturer*, Sept. 16].—"Fer Blanc" is the nom-de-plume of the author of an able article on chill roll progress, who thus loses the credit for his work. The remarkable change in the business conditions governing the making and selling of rolls is first described, close competition not only forcing down prices but raising the demands made upon the product. The enormous expansion of the tin plate business may be said to be the cause of most of this, for here the conditions which require a very long roll to give satisfactory results while working hot are unusually severe. A roll, especially a chill roll, is a product full of casting strains pulling in different directions. The factor of safety of 15 to 20 mentioned in the article is the same as that used in machine parts subject to reciprocating strains constantly repeated. There is a lack of proper balance, and unless the resultant of all of these forces acting against the resultant of the forces brought into existence during the performance of the work, is greater, something must give way and the roll breaks. Now comes the extra complication of the forces brought into play by the heating of the roll. The unequal and uneven exhaustion is sometimes too great, and many a roll goes to pieces the first time it is heated up. The author propounds a number of questions, the solution for which is wofully lacking. Thus he asks, "What are the causes for the cracking of a chill roll in cooling?" Is it a compression of the inner gray portion by the outer chill, or the contraction of the inner portion away from the outer chill? The reviewer does not agree fully with the author who states in substance further on that a co-operation between the mill manager and the founder, which involves no extensive experiments, is all that is required to get at the remedies for the troubles in the roll business; for right in the above question there is lost sight of the fact that both chilled and gray irons expand and contract according to laws characteristic of themselves. To know these laws and obtain from them a whole train of practical results requires money and skill, and the latter is not to be found in any great measure in either mill or roll foundry at the present time. Co-operation is certainly necessary, but one fact is lost sight of and that is that fully nine tenths of all rolls broken in service may be charged to carelessness or ignorance on the part of the roller. The omission of proper lubrication of the bearings means a broken neck as soon as it warms up. The sudden introduction of a billet not heated through sufficiently means not a stalling of the engine only, but often a broken roll Many mills get excellent results because they nurse their rolls carefully, while others who do not are continually in hot water with their roll makers. The author, who is evidently conversant with his subject, suggests that we should strive to obtain a more complete knowledge of the conditions of a roll, so far as its internal strains are concerned, when it has cooled and is ready for use. Then a knowledge of the distribution of heat in the roll in actual use and the consequent effect upon its physical characteristics. The author concludes with saying that while an elaborate series of experiments would doubtless furnish us an exact diagnosis and account for the failure of a roll, yet it would not be likely to suggest a remedy, and that therefore the reward for the expenditure would be an uncertainty. This claim will not be admitted as one which should be paramount by those who have been similarly placed in closely allied branches of the iron industry. The logical conclusions derived from experiments lasting for years, when applied in the recurring emergencies of daily work, have often balanced the ledger in a few days. This, however, presumes that the proper talent is available, for many an enterprising executive head of an industrial establishment has lost the greater part of the value of his experiments by having them performed by men lacking the training and temperament absolutely essential to insure success. The reviewer hopes to see some further work from the pen of "Fer Blanc."

THE KRUPP METHOD IN STEEL FORGINGS.*

BY GEO. H. BRYANT.

In presenting this paper before your society it is not my intention to deal in detail with the many processes of manufacturing hollow bored shafts and steel forgings, as the various methods have previously been extensively presented and discussed. The process that has been most thoroughly and elaborately submitted is undoubtedly that used to produce fluid compressed steel, and the Krupp Works a number of years ago made extensive and careful experiments with this method of making ingots for heavy forgings, and it is a noticeable fact that to-day they are using their method of casting a larger ingot than is cast by other manufacturers, and do not in any way use the fluid compression. The Krupp ingots are cast three times the diameter of the finished shaft, while the most modern works cast ingots of but twice the diameter the shaft is to finish. Segregation, of course, takes place in the center of every ingot, large or small, and as is admitted by the advocates of fluid compression, is not prevented by that process.

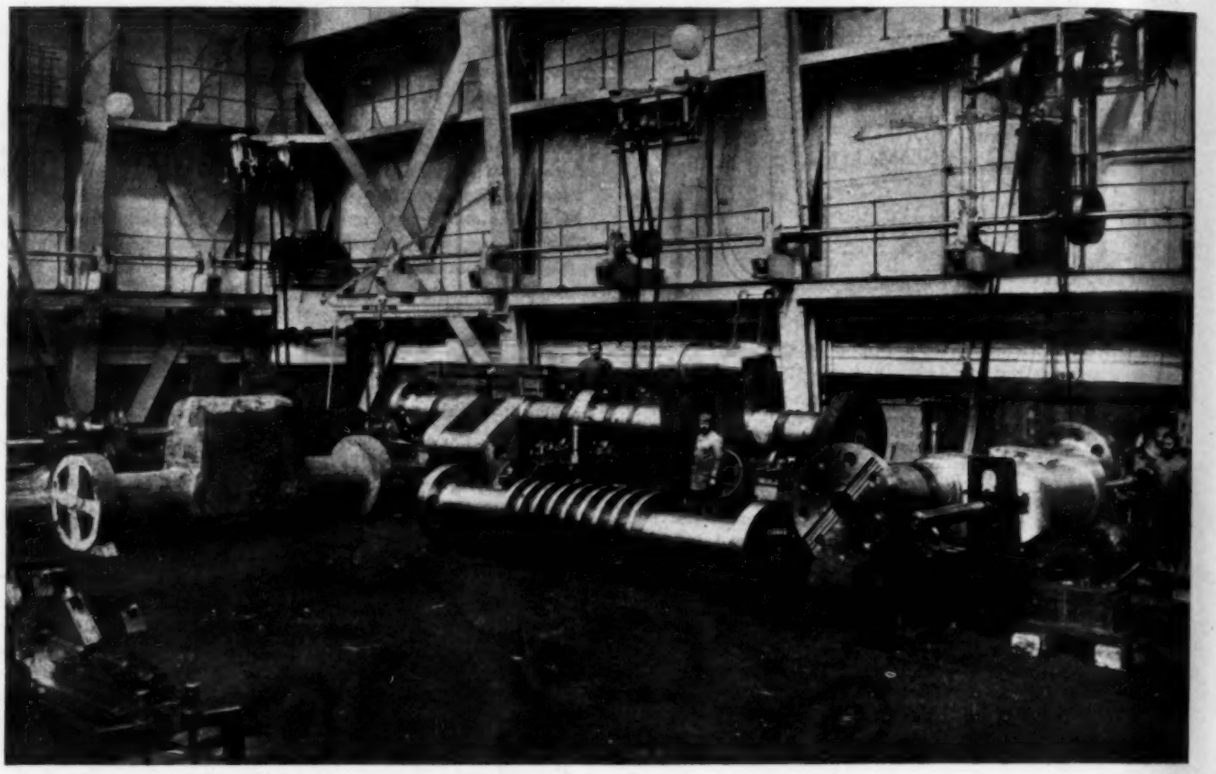


FIG. 1.—THE KRUPP METHOD IN STEEL FORGINGS.

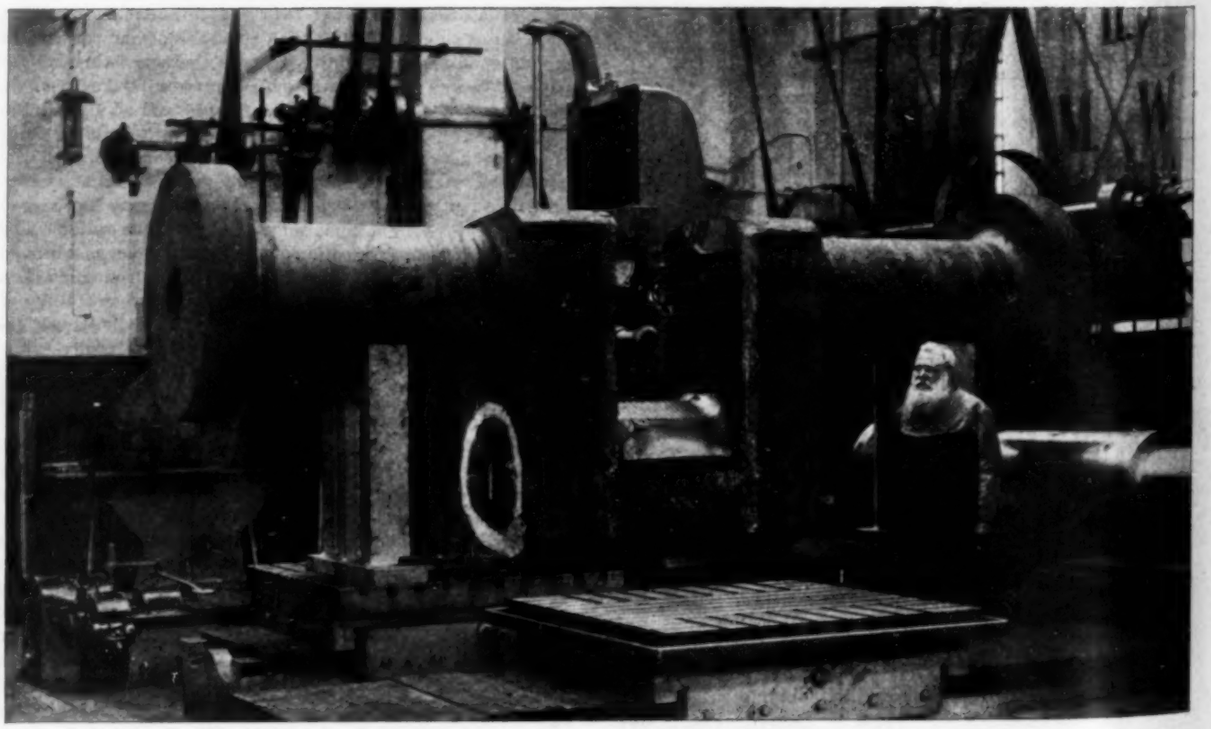


FIG. 2.—PART OF SHAFT IN THE ROUGH MACHINED STATE.

* Extracts from a paper read at the August meeting of the Western Society of Engineers.

Further on I will state how piping is prevented by the Krupp method, but first I will say that a longer section of an ingot can undoubtedly be used for the forging by the steel maker using the fluid compressing process, for the hydraulic pressure must force the gathering air or gas cells higher in the mold than the ordinary static pressure does. This is an economical result, however, of benefit to the manufacturer only, the character of the material in the melting charge and the subsequent forging and treatment being responsible for the character of the finished steel and its merit.

For many years the Krupp Works, and recently most of the works in this country, have used hydraulic forging presses for the manufacture of the largest shafts, as the material can be thoroughly worked by this process only, being a most important point for the strength of the shafts, and for this purpose the Krupp Works at the present time are equipped with a large number of hydraulic presses of different capacities from very small up to those of 5,000 tons effective power. At the Krupp Works, as above stated, the rule observed is that the diameter of the ingot must be three times the diameter of the finished shaft, while it is understood that the most modern works in the United States forge from an ingot but twice the diameter of the finished shaft. By the Krupp rule an ingot is drawn out to the high degree of nine to one as against four to one by the process employed in this country.

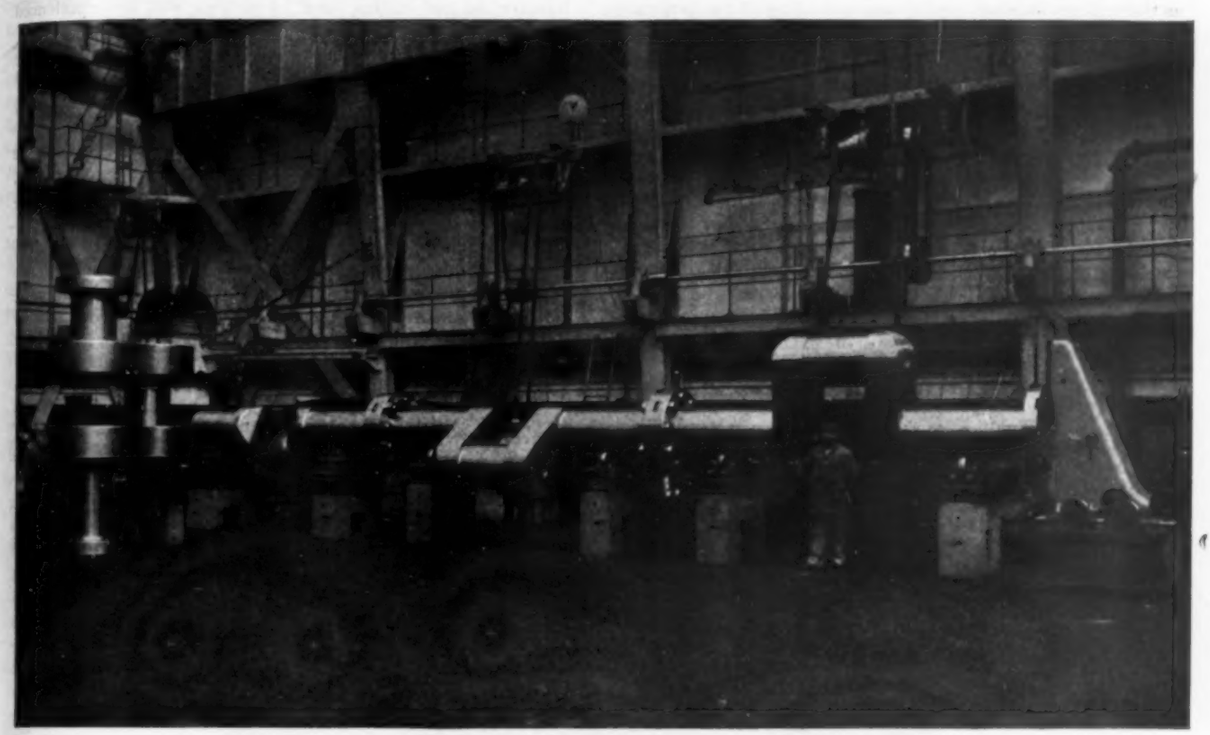


FIG. 3.—A THREE-THROW CRANK SHAFT.

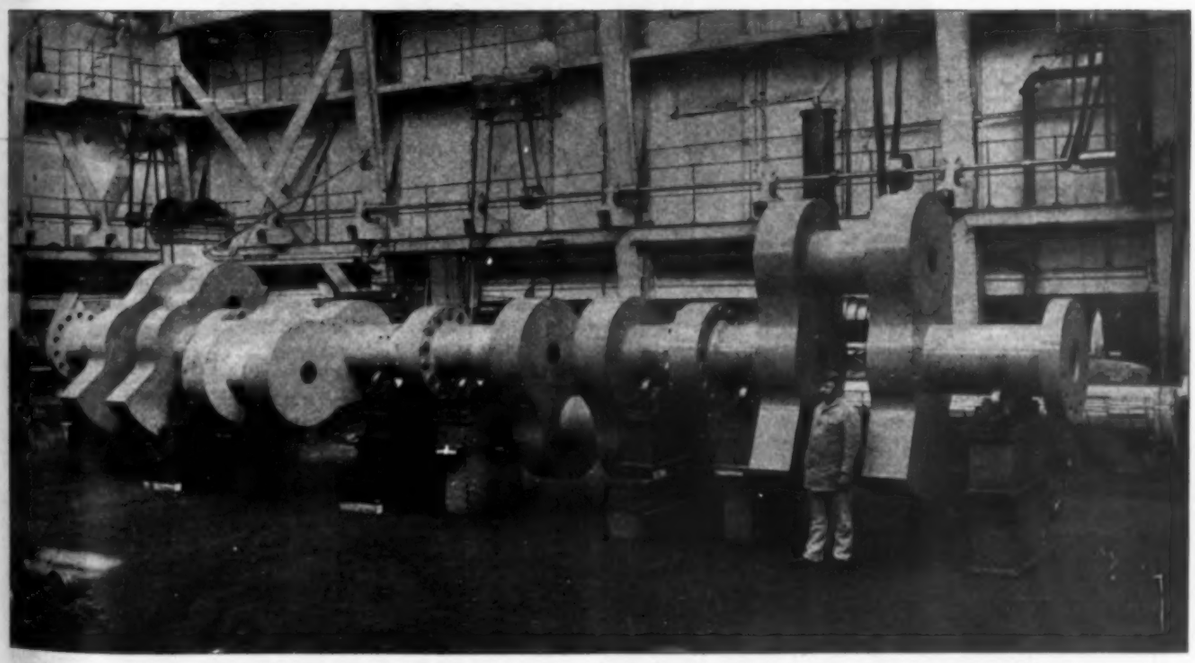


FIG. 4.—A FOUR-THROW CRANK SHAFT.

At works which forge hollow, a hole is bored through the ingot of the diameter of the bore of the finished shaft, consequently necessitating the cooling down of the ingot before being forged. Even if the ingots cool down very slowly, this method, nevertheless, involves considerable risks, as the strains which are unavoidably produced in the ingot, in this condition of largely crystalline structure, are likely to cause

cracks. The reheating of the ingot is for the same reason unreliable, even if the greatest are be taken. For these reasons at Krupp's Works, all large ingots for shafts and other heavy forgings are never allowed to cool down after casting, nor during the process of their manufacture, but are kept hot until the working of the forgings under the hydraulic presses has been completed. By working the ingot from its original heat the detrimental effects from piping are removed, as the strains causing piping are not allowed to generate, owing to the working from the hydraulic press both by compression and drawing out.

As to the most important advantage realized by boring out the ingots as done at works which practice forging hollow, is that in this way a part of the casting is removed to which the greater part of the impurities, such as phosphor, sulphur, manganese, etc., have segregated, it needs probably no further explanation that this end is attained much more effectively by Krupp's method in boring out the solid forged shaft, than by the process where the ingot is bored out, before having them forged down, in consequence of which a much smaller percentage of the impure material is bored out.

In the case of the crucible steel employed at Krupp's Works for shafts these segregations are of much less importance

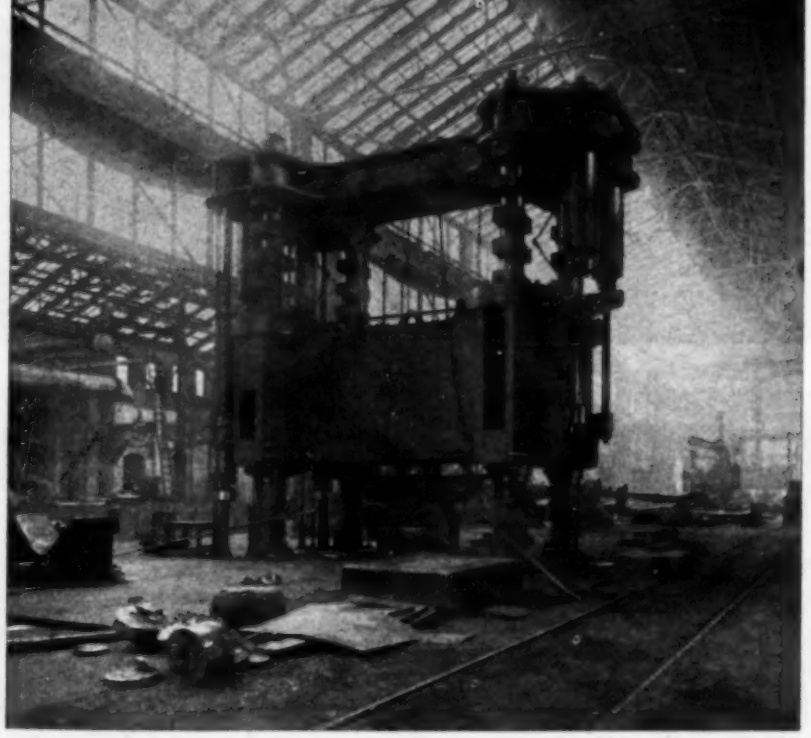


FIG. 5.—5,000-TON FORGING PRESS.

than in the case of open-hearth steel, which, according to a paper recently read before this society, can be qualified as high grade steel only if it contains not more than .04 of one per cent phosphor, sulphur and other impurities, while Krupp's crucible steel contains less than .02 of one per cent of phosphor, sulphur, etc.

While some works resort to the fluid compressing process in order to overcome the blowholes produced by the air and gases entrained into or generated in the casting, and to minimize the detrimental effect of these blowholes, I do not intend to dispute the efficiency of this process for obtaining the results aimed at. The experience of many years, however, and of numerous investigations with ingots of the larger size, entitles Krupp to the assertion that he employs a most excellent process of his own for producing solid castings, and results of comparative experiments have pronounced in favor of the Krupp method as being much more efficient than the fluid compressing process.

In regard to the question as to which material is the best and most reliable for shafts, it should not be omitted to point out the many advantages which distinguish Krupp's crucible steel from any other kind of steel produced by any other process, for crucible steel has just those qualities which make ingots proper for such forgings as shafts. The superiority of this material is founded upon the arrangements designed especially for this purpose, and furthermore upon the practice of many years which guarantees the complete control of the process, and especially the ability of charging thousands of crucibles uniformly, filling them exclusively with puddled iron and steel, manufactured especially for this purpose, by being repeatedly refined and freed from cinder by welding, hammering and rolling and by picking out by experienced workmen.

The melting furnaces have been improved to such a high degree that the greatest precision in the attainment of the required heat in all the furnaces, and in all crucibles necessary for one ingot is guaranteed.

A further advantage of the crucible process is the complete absence of the detrimental effect of the furnace gases, cinder, oxygen, and other gases in the molten steel, an indispensable condition for the production of solid ingots, and a condition that requires no fluid compressing to doctor up. The existing arrangements permit the casting of ingots of crucible steel up to 85 tons, which maximum has hitherto been more than sufficient for the largest shafts likely to be ordered.

Regarding the process of forging hollow upon a mandrel it may here again be pointed out that the selection of a much larger ingot at Krupp's Works, which allows a forging down of the cross-section of the ingot from 9 to 1, surpasses completely the advantages, if there be any, of hollow forging, especially so if the forgings are bored out after having been forged under the presses than if, as is done at some works, the ingots are only drawn out from 4 to 1.

Never having seen the report of a test piece taken from the inside wall of a shaft that has been forged hollow on a mandrel, I cannot say that it is not as dense as the inside wall of a shaft that has been cast solid, forged and then bored. But theoretically I cannot see why it should be, as the mandrel does not act as an anvil or die, since the shaft being forged, is not suspended upon the mandrel, but rests upon the press die, from which point the resistance is offered to the forging pressure applied.

If the metal in the center of a solid ingot is not compressed by hydraulic forging, the mandrel in a hollow ingot would be only a useless substitute for the core removed. If the center or core of a solid ingot is compressed by the forging press, it is decidedly a better method to forge to the center the greater volume of impurities and afterward remove them by boring, as per the Krupp method, than to remove only a

portion of them and forge the rest into the shaft, as must be the case if the mandrel is at all effective.

The origin of the hollow shaft is supposed to have been at the Krupp Works and no other maker has made as many nor any that have given greater universal satisfaction, but he does not deviate from the principle of casting solid, then forging and next boring. Furthermore, the oil tempering and annealing to which, of course, at Krupp's Works nearly every shaft as well as nearly every forging is subjected, after having been bored out, outweighs and even surpasses to a much higher degree the advantages claimed of greater density and finer grain from forging hollow, and the arrangements for oil tempering and annealing forgings of the largest dimensions can be considered as a standard, and the practice in the treatment of the different qualities is assisted very efficiently by the most improved apparatus for measuring the temperatures.

The certainty in the control of the crucible process guarantees the production of a material of higher tensile strength, without diminishing the ductility and toughness. There have been supplied for use in the United States a great number of shafts of the largest dimensions, the elastic limit of which was specified to be 45,000 lbs. per square inch, with an elongation of 18 per cent in 10 inches, and in all cases these minimums required for elasticity and elongation were considerably exceeded.

It may be here mentioned that at Krupp's Works nickel steel is used on a large scale for the production of shafts for steamers, also for axles and crank axles for locomotives, etc. A short time ago the Krupp Works turned out some nickel steel shafts for the large, fast steamers, which have been built for the North German Lloyd line. The ingots, from which these shafts were forged, had a diameter of 72 inches and weighed 60 tons each, the diameter of the crank shaft is 24 inches and the weight of a single crank bored and finished complete—three cranks to each engine—is 14 tons, while in the forged state the weight was 28 tons, or twice the weight of the finished shaft. The following are the results of the physical tests of the above material made by experts of the company:

Tensile strength, ...	85,000 lbs. per square inch.
Elastic limit, ...	60,000 " " " "
Elongation, ...	20 per cent in eight inches.
Contraction, ...	55 to 60 per cent and more.
Total length, ...	42½ feet.

"Several extremely large hollow bored, oil tempered, crucible steel shafts have been furnished by the Krupp Works for service in the United States from which test bars two inches in diameter, 48 inches long, tested at the Watertown Arsenal, by the United States Government inspectors, showed an ultimate tensile strength of 97,780 lbs., and an elastic limit of 64,000 lbs. per square inch, and a reduction of area at point of fracture of 51 per cent and elongation in 48 inches of 6.67 inches."

The usual quality of open-hearth and crucible steel furnished by the Krupp Works for crank pins, piston rods, connecting rods, etc., when no specifications are furnished will test about as follows:

Crucible steel.—Tensile strength, 78,000 lbs., per square inch; elastic limit, 50,000 lbs., per square inch; elongation, 22.6 per cent; measured on 8-inch length.

Open-hearth steel.—Tensile strength, 72,000 lbs. per square inch; elastic limit, 42,000 lbs. per square inch; elongation, 22 per cent; measured on 8-inch length.

A one-inch square section of either piece will bend double, cold, without showing fracture.

At Krupp's Works there are altogether 21 open-hearth furnaces, partly for the basic process and partly for the acid process, varying in size from 10 tons to 40 tons capacity, and with a total capacity of 300 tons. The largset ingots likely to be demanded can, therefore, be cast.

Fig. 1 shows in front, one of the open-hearth steel thrust shafts for steamship Havel and steamship Spree; weight 32,320 lbs.; dimensions, 18 feet 2½ inches long; diameters, 22 4-10th inches and 41¾ inches. Behind, two parts of three throw crank shafts of nickel steel for the North German Lloyd's steamer Kaiser Fredrich III.; weight of each part, 29,982 lbs. On the left hand side, forging of one-third of the same crank shaft of nickel steel; weight, 65,830 lbs. On the right hand side, one-third of the same shaft on the lathe.

Fig. 2 shows part of the nickel steel shaft for steamer Kaiser Fredrich III., in the rough machined state; weight, 33,069 lbs. In Fig. 3 is a finished three-throw crank shaft of nickel steel for the steamship Fredrich III.; weight 88,920 lbs.; length, 42 ft. 5⅞ inches; diameter 23 6-10 inches; tensile strength, 88,000 lbs. per square inch; elastic limit, 60,000 lbs. per square inch; elongation, 20 5 per cent measured on 8 inches. On the left is part of a nickel steel crank shaft for the steamship Kaiser Wilhelm; weight, 39,860 lbs. Fig. 4 shows a finished build-up, four-throw crank shaft of nickel steel for the Kaiser Wilhelm der Grosse (North German Lloyd); weight, 183,640 lbs.; length, 45 feet 9½ inches; diameter, 23⅝ inches; tensile strength, 85,000 lbs. per square inch; elastic limit, 58,000 per square inch; elongation, 20 per cent measured on 8 inches. Fig. 5 presents a view of a 5,000-ton forging press.

CONDITION OF BLAST FURNACES OF U. S.*

Sept. 1, 1898.

Location of Furnaces.	Coke and Anthracite					Charcoal.				
	Total No. of Stacks.	In Blast. Number.	In Blast. Weekly capacity.	Out of Blast. Number.	Out of Blast. Weekly capacity.	Total No. of Stacks.	In Blast. Number.	In Blast. Weekly capacity.	Out of Blast. Number.	Out of Blast. Weekly capacity.
New York	11	3	4201	8	6164	5	2	238	3	350
New Jersey	2	2	1509	0	0	.....	.....	.....	.....	.....
Spiegel	3	3	433	0	0	.....	.....	.....	.....	.....
Pennsylvania:						13	1	140	12	610
Lehigh Valley	32	6	4678	26	10630	.....	.....	.....	.....	.....
Spiegel	1	0	0	1	90	.....	.....	.....	.....	.....
Schuylkill Valley	11	6	4330	5	3647	.....	.....	.....	.....	.....
Upper Susqu. Val.	4	2	957	2	1300	.....	.....	.....	.....	.....
Lower Susqu. Val.	9	3	3801	6	2221	.....	.....	.....	.....	.....
Spiegel	1	0	0	1	375	.....	.....	.....	.....	.....
Lebanon Valley	11	6	5191	5	3452	.....	.....	.....	.....	.....
Spiegel	1	1	494	0	0	.....	.....	.....	.....	.....
Pittsburgh	28	26	55173	2	3150	.....	.....	.....	.....	.....
Spiegel	2	1	1282	1	1200	.....	.....	.....	.....	.....
Shenango Valley	16	7	10550	9	10244	.....	.....	.....	.....	.....
Western Pennsylvania	18	8	9783	10	6812	.....	.....	.....	.....	.....
Spiegel	1	1	500	0	0	.....	.....	.....	.....	.....
Maryland	5	3	4131	2	1570	4	1	125	3	424
Wheeling District	9	9	11582	0	0	.....	.....	.....	.....	.....
Ohio:						9	2	123	7	473
Mahoning Valley	13	8	13814	5	7218	.....	.....	.....	.....	.....
Central & Northern	9	8	11467	1	1475	.....	.....	.....	.....	.....
Hocking Valley	2	0	0	2	850	.....	.....	.....	.....	.....
Hanging Rock	12	7	3512	5	1149	.....	.....	.....	.....	.....
Indiana	1	0	0	1	130	.....	.....	.....	.....	.....
Illinois	16	13	24083	3	3765	.....	.....	.....	.....	.....
Spiegel	1	1	700	0	0	.....	.....	.....	.....	.....
Minnesota	1	0	0	1	629	.....	.....	.....	.....	.....
Wisconsin	4	3	2644	1	650	.....	.....	.....	.....	.....
Missouri	2	1	1045	1	650	1	0	0	1	316
Colorado	3	2	2159	1	1000	.....	.....	.....	.....	.....
Virginia	22	8	6337	14	8135	4	0	0	4	437
Kentucky	6	4	1876	2	912	3	0	0	3	200
Alabama	30	18	17095	12	9470	12	2	741	10	2250
Mich. and Wisconsin	.....	.....	.....	.....	.....	17	8	3993	9	3050
Tennessee	13	5	4123	8	5660	9	2	359	7	2310
Georgia	2	0	0	2	960	3	1	325	2	360
North Carolina	2	0	0	2	600	.....	.....	.....	.....	.....
New England	.....	.....	.....	.....	.....	11	2	260	9	858
Texas	.....	.....	.....	.....	.....	4	0	0	4	942
Utah	.....	.....	.....	.....	.....	1	0	0	1	175
Oregon	.....	.....	.....	.....	.....	1	0	0	1	275
Totals	304	165	206750	139	94008	97	21	6293	76	13030

SUMMARY.

Fuel.	In Blast. Number.	Month Previous.	Year Previous.	In Blast. Weekly Capacity.	Month Previous.	Year Previous.	Out of Blast. Number.	Month Previous.	Out of Blast. Weekly Capacity.	Month Previous.
Charcoal	21	22	21	6,293	6,459	4,555	76	75	13,030	12,830
Coke and Anthracite	165	165	140	206,750	200,318	180,951	139	138	94,008	100,466
Total	186	187	161	213,043	206,777	185,506	215	213	107,038	113,296

*Condensed from the *Iron Age*.

The first conflict between union and non-union men, on the strike of American Steel & Wire Co. employes in Cleveland occurred on Sept. 19 at the American Wire Mill. The strikers stood in the way of 20 Polish workmen who had been engaged to work at the mill and were about entering the yard, and a set-to occurred in which several men were slightly injured. Police dispersed the rioters.

A Great Outlook for Birmingham.

The feature of the Cincinnati meeting of the American Foundrymen's Association that evoked most comment was the address of James Bowron, treasurer of the Tennessee Coal, Iron & Railroad Co. It was delivered without a scrap of a note, and yet brought together a vast amount of facts and statistics. Its graphic style and forceful delivery held the association in closest attention, and at its conclusion the speaker was given a hearty expression of the appreciation and approval of his audience. Our issue of the week following the convention contained a synopsis of Mr. Bowron's address, but so great was the desire of foundrymen present for the general circulation of the full text that we reproduce it herewith from the Journal of the association:

When I came to this country 21 years ago from the collieries of Durham, and the iron furnaces of Cleveland in the old country, and located among corn stalks and cotton stalks, little did I realize that I was coming into the heart of a region which in a brief space of two decades should supply the very country from which I had come, as has taken place in the past month by the delivery via Bremen of Alabama iron into the very town of Middlesbrough. How strange it seems to realize that Birmingham, Alabama, where I live, is to-day the third largest point of export of pig iron in the world—Middlesbrough, Eng., being the first, Glasgow, Scotland, the second, and Birmingham, Ala., the third. Within the 18 months ending January 1, 1898, there were exported from Birmingham 297,000 tons of pig iron to foreign countries. This iron went to England, Scotland, Wales, Ireland, France, Belgium, Holland, Germany, Russia, Denmark, Sweden, Spain, Italy, India, Japan, China and Australia. Now there is something very remarkable in the local conditions which will permit an inland city like Birmingham to ship pig iron in such a way to every part of the known world, and especially to the city from which I came, and which, up to the time of leaving England, was supposed to be and was undoubtedly the center of production of the cheapest pig iron in the world. The Middlesbrough furnaces draw their coke from a distance not exceeding 30 miles, their limestones about 20 miles, their iron ore a distance of six to 18 miles, their pig iron not from the cast houses, because they do not use them, but from the pig beds under the open sky, and run it down on the little narrow gauge buggies to the wharves, where it is loaded on steamers. In spite of that we load our pig iron on cars in Birmingham and ship it 200 miles to Mobile, and then to every port of the known world. We ship it, as you gentlemen know from personal experience, to every State and Territory in the United States, to Canada, and Mexico. Why is it? We have not any better coal than exists in a dozen different places in America. We have no better ore than exists in a dozen different places. We have not got such gigantic bodies of ore lying on the surface to be scooped up by a steam shovel as in the Mesabi region; we have not got such ores as are to be found in the Gogebic district. Why is it we can do these things of which I have spoken?

Low Cost of Assembling Materials.

The answer is simple. You may take a large sized map of the Birmingham district, a map on a large scale, take a straw hat like this and put it down on the iron ore, coal mines and blast furnaces and cover it all up. Supposing you would consider these three fingers put together horizontally as representing, if you please, the top one, the carboniferous strata; the middle one, the sub-carboniferous, carrying the limestone, and the bottom finger the silurian measures, carrying red fossil ore. Then take an upheaval of nature, which makes an anticlinal which splits them open and thrusts them over, wash off the top of the iron with water and make a valley, and what have you got? A valley in the middle and three outcrops on either side, coal, limestone, and the valley between for the railroads to run down the whole of the valley, and blast furnaces and mills everywhere, where side tracks can be put in. When you consider the mileage which is involved in the assemblage of materials for the production of iron in other parts of the world, whether it be the carrying of coke from the Connellsville region, into Cleveland or Chicago, or whether you consider the mileage involved in the haulage of ore from Lake Superior to Pittsburg, you will see the differences involved economically by turning to compare the haulage of ore in the Birmingham district a matter of 6, 8 or 10 miles into the furnace stock houses, and the switching of coke a matter of half a mile, simply having the coke ovens put out of the way of the blast furnaces. When you consider that at the plant of Ensley, in the suburbs of Birmingham, for the purpose of illustration, we found it necessary that our friends the Semet-Solvay Co. (who are putting down 120 by-product coke ovens, in immediate contact with the furnaces, and who will deliver their coke without railroad freightage of any kind, simply a conveyor into the stock house of the furnaces), should excavate the coal in order that the foundations should not burn away, then you may realize that standing on the top of the water tower, with one of the rifles with which we are making the Spaniards cringe to-day, you can put a bullet from the top of the blast furnaces into the ore mines; you can take a revolver and fire a bullet on to the coke ovens or to the quarries from which the lime is drawn. Look any way you please for a mile to a mile and a half and we have everything needed to open out.

Ease of Working Ore Deposits.

In addition to this we must consider the ease with which the materials are worked. I have spoken of the way in which the ore outcrops on either side of the valley. The bed of ore, which is continuous, lies at an angle of about 30 degrees. It is opened at a height of about 400 feet above the valley, opened by stripping, working on the outcrop as far as may be desired, and from the first acre of ore which was ever opened in the Birmingham district, being at a point called Redding, the Morris Mining Co., who opened it for the Hillman estate, paid a royalty of 25 cents per ton, or $14,000 for the ore taken from the first acre. I have seen that ore 40 feet in thickness, top to bottom, worked by pick and shovel. That is, however, entirely exceptional. The average thickness of the ore as worked to-day is about 10 feet, and that is a very convenient thickness of working, because if you get above that it makes the timber heavier where timbers are used in mining. This ore you open at the outcrop and run your cross-headings right and left along the axis or longitudinal plane of the mountain. As soon as you have excavated the ore tributary to that opening you drop down 50 to 100 feet and repeat the operation, drive a fresh chute, take all the ore above you, work it out and drop down 75 to 100 feet again. The result is this, that while I do not know what other people are doing nor desire to dwell on what our own company is doing, but because the figures come more readily to my mind—whilst we are taking out about 1,600,000 tons of ore per annum, I looked at the map yesterday and the operation seemed like a scratch on the surface of the mountain. One might consider we have worked out perhaps an amount above water level equivalent to half a mile in length of the head of the ore. Our own company has 20 miles, and as we have been 20 years working the half mile, we shall be 400 years working the rest. I may safely promise all the friends here who are accustomed to use Alabama iron in their mixtures that they need not be in apprehension of a cessation in the supply for 400 years, and by that time we may have found a way to make castings last indefinitely. Now, gentlemen, it has become a very interesting question to us in this country within the past year or two as to what we are to do with our manufactured goods in the iron trade. The constant growth and spread, the growth in capacity and the spread in every direction of our products has led more or less in other trades, and I presume it must be somewhat the same thing in the foundry business to the getting into each other's way and treading on each other's toes. We have looked with satisfaction on the growth of an export business. Certainly 20 years ago one would never have dreamed of it. Twenty five years ago the production of pig iron in the State of Alabama was 11,000 tons. Last year it was 840,000 tons, a considerable growth in 25 years of time.

How Prices Have Fallen.

The expansion of an export business, as it is needless for me to say to an audience like this, lies in the low plane of cost which has been attained. When I first sold No. 3 foundry iron in 1879, I remember the first order I booked was for a pipe foundry, to go into cast iron pipe, and I sold it at $17 delivered at Lousiville, and the same iron to-day would be

delivered at half the money, $8.50. When we remember that it takes the same amount of ore to make the ton of iron as then, and roughly and broadly speaking, it requires the same amount of coke, it is a serious question and an interesting one, where has the economy come in? On the output of the company I serve, the scaling of prices represents $17,000 per day, and as the furnaces run 365 days per year, that represents nearly $6,500,000 per annum, our product has been scaled in value in 20 years. That economy has come partly by the washing of the ore, putting less silica in the top of the furnace and less slag at the bottom; partly by the washing of the coke, so that it contains less silica and requires less flux, and wastes less calories in the furnace; and by the expansion of production by the equipping of a furnace with engines to drive not at four to seven and a half pounds pressure, but 12, 14 and 16 pounds to the square inch, so that we get, not 45 tons per day, as was my first experience, but as high as 250 tons for an every-day product. These are the sources of economy, together with the universal trend of co-operation, the putting of business to business and bringing greater outputs and greater masses of material under one management, and one general expense. This action, it is needless to say, is on the same principle on which the foundrymen are governing the business by the chemical laboratory, which has played such an important part in the production of pig iron. The blast furnace gas, which in Scotland 25 years ago used to flash out into the open air, is now corraled, and the ammonia, tar, naphtha and creosote extracted therefrom and sold. It is supposed that the Scotish blast furnace owners make more money from the by-products than from the pig iron which they sell. That, of course, cannot be obtained in this country, where we use not raw bituminous coal, but coke. But what we can do, and what is being done, to facilitate economy in the production of pig iron, is to erect plants to secure the by-product from the coke oven gas.

Steel an Important Outlet.

Now with this constant march of economy and constant expansion of product, we have got to the point where we need foreign markets, and we are taking them very rapidly, not only in iron but in steel; and while this is a meeting of foundrymen, very few of whom produce or use steel, still the two materials are becoming correlated together more and more everyday. This is indeed the age of steel. It is a wonderful thing to consider, and a very serious one for producers of pig iron to consider, that whereas the consumption of iron as steel has increased 1,500,000 tons per annum in the last 10 years, the consumption of iron as iron in elementary form has decreased 1,000,000 tons per annum. That is one reason why a good many blast furnaces are standing idle to-day. It is not the only reason. All nations are subject to times of delusion and wild ideas. Those who have heard the gifted American lecturer, George R. Wendling, on "Popular Delusions," must remember his vivid descriptions of the South Sea bubble and various other phantasmagoria. A singular delusion swept over this country some years ago which caused a great many poeple, apparently sane, sober and in right mind, to believe that by the construction of a blast furnace they could turn a cabbage garden or some vacant pine land into an important boulevard of a city, the lots of which were worth at least $1,000 per front foot. So it has transpired that there has been in this country a plethora of blast furnaces, and in the last 10 years many of you have derived an advantage at the expense of the creditors of the blast furnaces which have supplied you with pig iron below the cost of production. And it lies well with you to seriously consider the fact that those days have passed and that creditors, as a rule, however, lenient, indulgent, and tolerant, come to an end of desiring to throw good money after bad, and to maintain insolvent furnaces in the hands of assignees and receivers solely for the friendly purpose of supplying the members of the American Foundrymen's Association with pig iron below cost of production.

As I said in the beginning of this portion of my address, the popular delusion about the construction of blast furnaces, necessarily involving a fortune, is responsible for a good many idle furnaces. But the switching off of so large a part of the world's consumption from iron into steel is responsible for a great deal more, and that is a permanent change, and one not only permanent, but increasing. To what extent steel castings may take the place of iron, I am not competent to offer an opinion; but as I am not speaking on that subject, but of the Southern iron district which to-day furnishes, I suppose, half of the foundry irons made in the United States, it is a very serious thing, and it is proper that in drawing your attention to this general outline of the district and its ituation I should refer to the question of steel. I remember it says in the good book that although Haman sat at a banquet of wine with the king and the queen, he answered: "All these things avail me nothing, so long as I see Mordecai sitting in the gate." He was the fly in the pot of ointment. It avails us nothing that we make cheaper foundry iron than any other concern in the world, if we cannot get money enough to pay the salaries of the officers on the first of the month, and creditors send their boys around with all sorts of little duns. It therefore becomes necessary to divert the product of the Southern district from foundry iron into steel. For a great many years people said you could not do it. I do not know why it is or what we have done in the South to give rise to such incredulity. I do not think Southerners are more prone to magnify their abilities than other people. There is a good deal of "Americanism" about exploiting ourselves and not hiding our light under a bushel. There is no reason why we should not; we have the grandest country to-day under the canopy of heaven. We are not compelled, as the richest country in the world—England—is, to import our food. We are not circumscribed by hostile nations with official boundaries where, if a man is espied on the wrong side of a tree, he is to be shot as a spy. We are protected on either side by the Atlantic and Pacific. We extend from the torrid region to the frozen shores of British America. We produce every kind of food, and feed mankind, and ship grain abroad. The reason why iron men are protectionists is that we know that, whereas the countries of the old world are compelled to get food from us because they cannot raise it for themselves, we can raise enough for our own people and have a surplus for other countries, and compel them, if we desire to pay us in money or credit, and not in manufactured products on which they would charge us a profit. Let us take their money and make our manufactured goods at home.

Incredulity Concerning Alabama Iron.

We have a right to be proud of our country, and as every man speaks that which he does know, so I as a Southerner, speak that which I know when I say that we have a fine part of this country, and do not say so in any selfish spirit, because this is a free country and Alabama is a free State. In Birmingham we have men come from North, East and West, so no man has any claim to this town of the South over and above another on account of birthright, either the Northerner or the Southener; it is all one. We do not ask where a man comes from, who was his grandfather, or what has he got We are practical people, every man coming from the North comes into the land where they are just as glad to see him a one of their own. We know we have got, and you have got, as part owners of Alabama, a fine country. It amuses us therefore to see the incredulity with which people have said all kinds of things about our iron from time to time. I remember when going to St. Louis in 1879, to sell foundry iron there, a gentleman said: "What! Tennessee? Alabama? No, no, no. Could not think of such a thing. Would not think of using anything in my mixture other than Hanging Rock charcoal or Glengarnock No. 1." Now we send iron to Hanging Rock and to Glasgow in the place of Glengarnock! I used to see in some of the writings of our Eastern friends with headquartes in New York, in the journals there, that it was true a little iron was coming, but it would not make any difference—it was only a drop in the bucket—came as a sample—could not afford to send it there—it was an experiment. I have heard of boys whistling to keep their courage up in going through a graveyard; but whistling kept up and the iron kept up, and the next thing we hear was, "Of course these people are putting in their iron, but it is an inferior quality and would not sell as well as other irons." By degrees it got to command the same price, and then they said, "The iron is all right enough, but they are losing money and cannot afford to send it there, and there will be no more of it." We did not shut up, but built additional furnaces and made more iron, and so it kept on.

The next thing we heard was, "Of course it is all right for

the foundry business, but it is a high silicon iron, and will not do for any mixture where strength is required." The next thing, out of the basic iron we make for the steel makers in every part of the United States, we see the foundrymen come to us, saying, "Give us of your basic iron, that we may use it instead of charcoal iron to put strength in our mixture." The next thing we hear from our critical friends as to Southern iron was, "Of course they may use it in a highly silicious mixture or for strength, but for open-hearth steel it will not do; they may take a little and mix it with Northern iron, but it is not an iron to make steel of." It looked for a time as if there was a little bit of truth in that idea, because the Southern iron is silicious, too much so for a basic open-hearth process, the phosphorus too high for acid process, either Bessemer or open-hearth; but by the discovery of limitless beds of dolomite, in one of which I could show you within six miles of Birmingham a face 40 feet deep and extending as far as you would want to run, a dolomite with less than one per cent of silica, which is not only suitable for basic additions, but for furnace repairs, and is also suitable for use in the blast furnace, and we carry a sufficient burden of it to keep down the silica. We are able to make basic iron with it and make it down to .02 or 2-100 parts of one per cent of silicon in the iron in the blast furnace, and on that account I say we can do anything required for the manufacture of steel. We have therefore run one blast furnace continually for three years making iron for open-hearth basic steel works for such concerns as Carnegies, Illinois Steel Co., Park Bros., Jones & Laughlin, A. & P. Roberts, Cleveland Rolling Mill and others.

What remains for us to say, as we are saying now, "If such things be done in the green tree what shall be done in the dry?" Let us make our own steel, cease to make pig iron, and ship it to every part of the world. It is a fact that within the next 30 days, undoubtedly, the papers will be signed which will divert within a year, probably one-half of the iron which is now being supplied from the Birmingham district to the founders of the United States, into the steel works which will be there constructed, and there will be a large diminution in the supply of cheap pig iron which is being offered to you from the Birmingham district, unless such a little incidental modicum of profit as 25 cents to 50 cents per ton can be added to the price as to justify us in putting in more furnaces with the large expenditures which that involves. Now, then, in conclusion, I want to draw your attention to this—without in the slightest degree working anybody for the moving of works, as that is a thing I do not believe in; a business which is not worth running where it is as a rule is not worth moving—this business of employing industrial agents to run around the country begging people to remove their plants to other places is all humbug, but there is this consideration which is open to your minds and which I offer to you. Suppose you are making stoves or iron pipe, or radiators or sugar machinery, or any other kind of material which can be exported to foreign countries. It becomes a very serious question whether it is not worth while to look into the situation of the South with a view to establishing a branch of your industry with especial reference to an export business.

Transportation Facilities.

Now the distance from Birmingham to the sea coast is only 268 miles. The railroads are liberal. We can reach Pensacola by the Louisville & Nashville system, Mobile by the same, and by a combination of the Southern Railway and Mobile & Birmingham, and by a combination of Alabama, Great Southern and Mobile & Ohio. There is easy transport and the roads are liberal in their rates. Birmingham is situated 602 feet above tide water, the weather is pleasant, the climate benign. I lived 13 years in Nashville, and now 209 miles further south, in Birmingham, I can state the climate is milder than in Nashville. Latitude does not count, the elevation does. We have 600 feet of elevation and are near enough to the Gulf to obtain our share of the influx of the cool air which sets in all around the United States to take the place of the vast mass of heated air rising from the great interior of our continent throughout the hours of daylight. So there is always a movement of air which makes it a pleasant place to live in.

I say, speaking of railroads, with a fall of 600 feet against 268 miles you see there is an average fall of two and a quarter feet to every mile of railroad from there to tidewater. That being in favor of the load, enables a railroad to make extremely low rates, and they carry pig iron and heavy castings to the Gulf for export for $1 per ton. Now, then, when you consider the movement of the cotton crop of the United States from southern ports, when you remember that that movement this year was over 10,000,000 bales, and was almost entirely confined to the ports, say four-fifths of it, from New Orleans to Norfolk inclusive, when you can go from Birmingham to Mobile and Pensacola for $1; Port Royal, Savannah and Charleston, $1 75; Norfolk, Va., for $2 21, then you have marvelous opportunity for shipping your heavy iron goods in connection in some cases with cotton and in others coal and coke, to foreign countries. Why, the other day we shipped a cargo, for example, of pig iron with coke on top of the iron from Pensacola direct to Yokohama for $5 from Pensacola, a through rate of $6.

With the enormous growth of manufacturing, with the continual cheapening of the cost of your castings, with the results you are obtaining from the comparing of notes in your foundry associations, not only this one but also in your local associations, from the application of economic chemistry to produce the best results, I insist that you as manufacturers of iron goods are getting into the same position as we who are producers of pig iron. You are getting to the point where you are able to compete with every other foreign nation where the lanes of ocean commerce will enable you to obtain transportation and to move your goods, and I do not know any place in this particular line where a plant can put itself in immediate physicial juxtaposition to coal or coke, limestone, pig iron, with a half dozen railroads, with nominal rates of freight to the sea coast for export, and with a river which is now navigable to 40 miles from Birmingham and which, in the course of a few years more, will enable heavy products to be carried to Birmingham or Mobile at a cost not exceeding 60 cents per ton, except in our section. There is a locality which is going to dominate a great part of the world in years that are to come.

The Widening Foreign Trade.

I believe the consensus of opinion of this country is going to lead to control of the Philippine Islands now that we have them, and that along with the ownership of that rich and productive spot will give of necessity the Caroline Islands, 2,000 miles nearer to us. I believe when we take Porto Rico we shall keep it. I believe that when the insurgents in Cuba, what few of the poor miserable fellows are left after the cruel oppression they have suffered, the starvation and warfare with the Spanish, may be left, I believe if they then have the opportunity as we shall give it to them of ruling themselves, there may not be sufficient of them to control it, and they may find it necessary, for the preservation of order and wealth, and preservation against the Spaniards, who remain, to turn it back to us or to have an American protectorate. If these things are done, whether it be so or not with regard to Cuba, the acquisition of territory in the Chinese seas will extend our Pacific border 7,000 miles in that direction, and I am confident that the American nation will never again dare to await the approach of a day of trouble with the risk and necessity of sending an Atlantic fleet a voyage of 13,000 or 14,000 miles in the way our splendid Oregon made the trip, and that means the construction of a canal through the isthmus, and the day that the canal is made, while I speak as an American, I cannot close my eyes to the incidental results which will give the Alabama coal fields the control of the Pacific coal trade from San Francisco to Valparaiso, putting steam coal on ships at Mobile or Pensacola at the same price that it used to be put on board at Newcastle or West Hartlepool. There can be no other country which can occupy the Pacific coast as we can, and it will double the value of the Alabama coal fields and the industrial activity that exists to-day; and to those gentlemen in the American Foundrymen's Association who take time by the forelock and plant themselves with the intention of taking advantage of the changes which this war is bringing about, I say they will reap, in my belief, a splendid harvest of reward for their foresight.

THE Brown-Bonnell Iron Co., Youngstown, O., will spend $150,000 on a continuous mill. Work on the addition will begin soon.

IRON MINING METHODS IN SWEDEN.*

BY PROF. G. NORDENSTRÖM.

In Sweden, as in several other countries, diamond drilling is used, as well as shafts and drifts, for exploring ore deposits. In other countries, larger and more complicated machines are generally used, with which cores from 230 to nearly 400 millimetres in diameter are obtained, and which can drill holes as deep as 2,000 metres. Such large diamond drills have only on a few occasions been used in Sweden, and on account of the great compactness which, as a rule, characterizes both our ores and their country, it is not at all necessary to use drilling machines which give cores of so great a diameter. In our iron ore mines we have, since 1887, used very simple, cheap, and easily transportable diamond drills which bore holes whose cores have a diameter less than one-tenth as great as the smallest diameter given above.

All the drilling done with these machines has been executed by the Swedish Diamond Drill Rock Boring Co., Ltd., in Stockholm; and the total depth of the borings put down by this company in ore mines, alone, since the aforesaid year—1887—amounts to 30,000 metres. In the year 1897 alone they bored about 4,000 metres. Thus, there are doubtless few countries where researches in mines by means of diamond drilling have been made to such a great extent in proportion to the production of ore as there have been in Sweden. The drills belonging to this company are partly run by hand power and partly by petroleum or electric motors. Especially during the last few years the l tter have come into more and more extensive use. The hollow drill rod is composed of steel pipes, each two metres long, and with an outer diameter of 33 mm., and an inner diameter of 25 mm. The diameter of the drill hole is 35 mm., and of the core 22 mm.

In rock of medium hardness these machines will bore 1.0 to 1.05 metres in 10 hours when hand power is used, and 2 or 3 metres in the same time when petroleum or electric motors are used. The cost of the drilling itself amounts to 15 kronor (17s. 6d.) per metre to a depth of 60 metres. For greater depths than 60 metres 22 kronor (£1, 2s.) per metre is charged. The mine owners must, however, pay the workmen who assist the drilling master, and pay 10 kronor (11s.) for the first hole drilled, and 5 kronor (5s. 6d.) for every following hole. Since a reduction is made for a larger number of holes, the average cost will be only about 18 or 20 kronor (£1 or £1, 2s 3d.) per metre drilled. The holes are drilled in any direction, and holes up to 144 metres deep have been drilled in rocks and ores of great hardness and compactness. The greatest depth reached with these drills is thus much less than that which can be reached by the help of larger diamond drills, but for the present purpose a depth of nearly 150 metres is quite sufficient.

Breaking Ground—Methods of Working.

For breaking ground in Sweden, as in other countries, boring and blasting are used, when the ore and its country rock are of a compact nature. The boring tools used, both hammers and drills, for more than 30 years have been made entirely of steel (Bessemer or open-hearth), and as explosives, only preparations of nitro-glycerine have been used for an equally long time. Gunpowder is no longer used in mining. Everywhere in the Swedish mines the boring tools are adapted so as to give the greatest possible effect. In order to do this, it is necessary to have the hammer as heavy as possible in relation to the drill, or, if P is the weight of the hammer, and P_0 that of the drill, it should be so arranged that the relation $\frac{P}{P+P_0}$, which also represents the relation between the effective work and the total work, is as great as possible, and has also always been the rule. In single handed drilling, which is now exclusively used, the weight of the hammer generally varies between 3.5 and 4.5 kilogrammes, and the average weight of the drill 1.4 to 1.7 kilogrammes. Thus, the ratio $\frac{P}{P+P_0}$ is, in Sweden, equal to 0.67 up to 0.75, while in several other countries, where in many places the weight of the single-handed hammer is only 1.25 to 1.5 kilogrammes, the ratio is only 0.47 to 0.50, or at the most 0.57. Besides adapting this ratio of weight, the working effect has also been raised by using steel of suitable hardness for the drilling tools and by giving the bit a shape suited to the rocks, which are, as a rule, hard. By these means such advance has been made that it has been possible to use hammers for drilling 1,500 up to 3,000 metres without their wear or loss in weight amounting to more than 0.3 to 0.6 kilogrammes; and as to the drilling effect, it is usual, in underhand drilling to drill 250 to 375 mm. per man per hour, and sometimes up to 600 mm.

Considering the great hardness of the rock and the ore, great efficiency is attained in hand drilling, and for this reason, rock drilling machines have not come into practical use in the mines until about 20 years ago, since which time their construction has been greatly improved. Their use is, even now, far from common. Another circumstance which contributes to the slight use of drilling machines is that they are not quite suitable for stoping, which is the most common method of working in the mines. There are certain difficulties in placing rock drilling machines on the wide and precipitous stopes, 10 to 18 metres high. On the other hand, in mines where filling is used these machines are much in use, and give advantageous results. Such mines are found at Norberg, Dannemora, Striberg, and Stripa, where drilling machines are used both in overhand and cross-stoping, and in driving galleries. Among the different kinds of compressed air-drilling machines used, Schram's and Rand's, and modifications of the latter made in Sweden, have been found to be the best for general use. Electric rock drilling machines have also been tried in recent years. In these trials, machines of Siemens and Halske's make have been used, and also, although for a shorter time, machines of the Marvin type.

In order to give an idea of the efficiency which is generally reached in using drilling machines, it may be mentioned that in overhand working, which is the usual method, the amount of rock broken loose per workman and per year of 300 days, amounts to 1,000 to 1,600 cubic metres, or, estimated in weight, 3,500 to 5,500 tons; and in driving the advance by the use of drilling machines is generally twice as fast as by hand drilling when the same number of workmen are employed.

As to the general effect of blasting in the mines, experience shows that in stoping, overhand and cross-work, the amount of rock broken down varies between 10 to 15 tons per kilogramme of explosive, and between two and three tons per metre drilled In favorable circumstances the former figure can rise to 20 to 25 tons, and the latter to four or six tons.

In regard to the methods of working, I have already intimated that overhand stoping is in most common use. Over 80 per cent of all the iron ore mined in Sweden is mined according to this method. The method is also used in its original form, or without filling. In Gellivare and Grängesberg, open-cast working is mostly used. The excavations thus stand open, and their walls are supported by rock pillars, and, where necessary, by more or less complicated timbering between the hanging-wall and the foot-wall. This method has been used since time immemorial, and it has always given good results both technically and economically. This has, of course, to a large extent, depended upon the fact that both the iron ores and their surrounding rocks are generally of a very compact nature.

In the mines where this is not the case, the filling method has been resorted to during recent years; and the same change has even been introduced in some mines where the ore and rock are compact, but where the ore deposit has been very thick, and mining has therefore been accompanied by difficulties, especially at greater depths. Among the methods belonging to this class, overhand and cross-working are exclusively used, and their adaptation does not, on the whole, differ from the corresponding methods in use in other countries. The only more notable difference is the width of the stope when overhand working is used in mines with ores of a compact nature. In such cases the width of the stopes can rise to 12 or 15 metres, and sometimes, i. e., at Dannemora, up to 30 metres.

THE Pennsylvania Tube Works Co., Pittsburg, will substitute electric for steam power in its large plant some time during the coming winter. A distributing plant of 1,000 h. p. capacity will be erected, and the power transmitted throughout the butt and lap weld departments by means of motors of 40 h. p. each. The electric plant will be located near the Monongahela and the boilers joined to the present battery.

* Extracts from a paper read at the Stockholm meeting of the Iron and Steel Institute, August, 1898.

INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants :—

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

The Langenan Mfg. Co., Cleveland, has been incorporated to manufacture steel and metal products. Capital stock, $50,000. Incorporators, W. C. Langenan, Mars Wagar, W. W. Powers and others.

The Board of State House Commissioners, Providence, R. I., will open bids for 400 h. p. boilers Sept. 24.

The American Machine Co., Flint, Mich., has been incorporated with $50,000 capital stock. The officers are: James Slocum, president, M. C. Hutchins, vice-president; W. C. Durant, treasurer; W. C. Orrell, secretary. Two branch offices have been arranged for—one at Columbus, O., with H. R. Cooley as manager, and one at Detroit with Harry Brown as manager.

New Construction:—

It is now expected that the new plant of the Lane & Bodley Co., of Cincinnati, will be built at Norwood, Cincinnati, instead of Bond Hill. At Norwood is being erected the plant of the Bullock Co., manufacturer of electrical machinery. An arrangement is under negotiation by which the Lane & Bodley Co. will manufacture the Bullock Co.'s castings, and the latter company will not build a foundry. The big water works contract the Lane & Bodley Co. has on hand will require greater facilities than the company now has. Among the large machine tools being built for this work are a big planer, 16x16x56 feet in working parts, 112 feet long and 32 feet high. The largest boring machine in the world will be set up in the new plant, having a diameter of 32 feet, a swing 32 x16 feet, and being 32 feet high. A third machine will be the hydraulic press, which will have a nominal capacity of 500 tons, and be capable of 1,000 tons. It will have a four-foot stroke and be 38 feet long. The key-seating machine will cut a key seat in a wheel hub five inches wide and four feet long.

Ground will be broken soon for the erection of an extensive tin plate plant at Avonmore, near Pittsburg, on the West Penn Railroad. The new company has a capital stock of $200,000, and the new works will give employment to about 300 men. The company is composed of W. H. R. Hilliard, M. M. Garland, ex-president of the Amalgamated Association; Oliver Wylie, W. S. Collier and T. H. Jeremiah. The works will consist of a six-mill tin plate plant. The company has absorbed the Alcania Tin & Terne Plate Co., of Youngstown, and the works of the latter are to be suspended. It was only a dipping mill, but the new plant will make the black plates as well as dip them. W. S. Collier was president and T. H. Jeremiah manager of the Youngstown company. The Avonmore Land Co. has donated 10 acres for a site for the plant. The land company is to give the new company a cash bonus when the plant is in operation, and a certain number of men employed. It is expected the plant will be completed and in full operation by April 1 next.

Stacy Reeves & Sons, Philadelphia, are receiving bids for the construction of a boiler house stack, coal shed, etc., at the Frankford Arsenal, Bridesburg. The boiler house will be 43x46 feet.

At Flomaton, Ala., the foundry of E. Walker, recently burned, is being rebuilt.

The Berlin Iron Bridge Co., East Berlin, Conn., have the contract for furnishing the steel work for the Memorial Hall, being erected at Westerley, R. I. This building is to be fire proof, has steel floor beams and columns supporting the floor structure, and steel trusses and beams for the roof.

The New York, New Haven & Hartford Railroad Co. has taken an option on the Norwalk, Conn., fair grounds, the plan being to erect repair shops.

Fraser & Chalmers will begin soon the construction of buildings to complete their plant at Chicago. The machine and erecting shop will cover 320x105 feet. The perforating buildings will be one story, 60x100 feet, and the tool and stock room will be one story, 175x50 feet.

Preparations are being made by the Cramp & Sons' Ship & Engine Building Co., for the erection of an immense shop in Richmond, Philadelphia. It will be 100x120 feet.

The Massey-Harris Co., Toronto, Ont., has taken out permits for the erection of a single story brick molding shop and a two-story brick core shop.

The Missouri Car & Foundry Co., St. Louis, is building a malleable iron foundry at its works at Madison, Wis. The building is about 600 feet long and 175 feet wide. The company has also contracted for an addition to its wheel foundry at Madison. This will be a steel structure 250 feet long and about 175 feet wide.

J. Orwig & Co., proprietors of the Niles (O.) Boiler Works, has let a contract for the erection of a building of the same size as the one they now occupy. They have also ordered several new machines, together with a complete arc and incandescent lighting plant. The output of the works will be more than doubled and from 80 to 90 men will be employed.

The Buhl Stamping Co, Detroit, Mich., has plans for a new building 35x95 feet, of brick, with metal roof. Bids are being received.

Additions, Enlargements, Removals, Etc.:—

The Plano Mfg. Co., West Pullman, Ill., manufacturer of harvesting machines, will put up three additional buildings of brick and three stories. One will be 88x292 feet, another 128x80 and the third 60x120, the first for manufacturing and the others for storage. The company has started its shops on the preparation of stock for next season, two months earlier than usual.

The foundry building of the Youngstown Foundry & Machine Co., Youngstown, O., is being considerably enlarged and a 20-ton traveling crane installed.

The Niles Boiler Co, at Niles, O., has let a contract for the erection of an additional building the same size as the one it now occupies. The company has also ordered several new machines, together with a complete arc and incandescent lighting plant.

The Watts Steel & Iron Syndicate, Middlesborough, Ky., is building an addition. Buildings will be erected and equipped with machinery for a 22-inch mill, machinery having been ordered. Another 10-inch mill is being considered, and plans are being made.

The Standard Wheel Co. is about to enlarge the plant in Terre Haute, Ind.

The Lynchburg, Va., city council has agreed to exempt from taxation for 10 years the Barber Wagon Mfg. Co., which proposes to move its plant from South Boston to Lynchburg.

Jones & Laughlins, Ltd., Pittsburg, are tearing down 30 dwelling houses on the mill property, for the purpose of making additions to machine shops and cold-roll department. The company has secured options on property adjoining its mills.

Cutting & Bardwell, of Worcester, Mass., have the contract to build the extension of machine and carpenter shops of the Ludlow Mfg. Co., Ludlow, Mass. The shop extension will be 148 feet long, 58 feet wide, three stories high, with elevator tower.

The Waltham Watch Tool Co., Springfield, Mass., is building an addition 62x30 feet.

Fires and Accidents:—

The harvesting machinery plant of the Hunt Mfg. Co., of Walla Walla, Wash., was destroyed by fire Sept. 14. Loss $25,000. The Hunt Mfg. Co. will rebuild at once with an increased capacity.

The machine and pattern shops of the Adolph Leitelt Iron Works, Grand Rapids, Mich., burned Sept. 10. Loss, $30,000; insured.

The works of the Iron City Mfg. Co., corner of 23d and Mary sts., South Side, Pittsburg, were completely destroyed by fire Monday morning, September 19. The loss on machinery and stock is estimated at $8,000; insurance about $2,000. The company was engaged in the manufacture of steel ceilings, iron and steel roofing and other material in that line.

General Industrial Notes:—

Aultman, Miller & Co., of Akron, O., mower and reaper manufacturers.

The Weir Plow Works, of Monmouth, Ill., were sold Sept. 16, under order of the court, to Kingman & Co., of Peoria,

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"BLUE STEAM."

Ever notice the color, or apparent color effect, of a jet of steam issuing from a pet cock in a live steam main? Was it whitish? That was due to entrained moisture. The bluish color, or perfect transparency, is present only when the steam is dry.

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Ill., for $35,000. It is reported that the equipment will be removed to Peoria.

The Rock Island (Ill.) Plow Co. has shut down for four weeks. Extensive alterations will be made and new machinery added.

The Shiffler Bridge Co., of Pittsburg, has recently taken the following contracts: Structural steel work for ore yard trestles, coke and ore bins for Laughlin & Co., Pittsburg, and Riverside Iron Works, Wheeling, W. Va., to contain about 5,000 tons of structural material; foundry and machine shops for H. K. Porter & Co., Pittsburg; new ordnance machine shop for Midvale Steel Co., Nicetown, Philadelphia, 121x416 feet provided with runway for 100-ton traveling crane; a 64-foot extension to present ordnance machine shop previously constructed by the company.

J. E. Rhoads & Sons, Wilmington, Del., are in the market for a 40 to 50-h. p. tubular boiler, second-hand, and are inquiring prices on a vacuum pump and automatic damper regulator.

J. R. Cook & Son, Americus, Ga., have been incorporated with a capital stock of $50,000. The firm intends to remove its foundry and machine shops from Oglethorpe.

The Mairtin-Dacey Machine Co. has begun operations at Florence, Ala.

The National Sheet Metal & Roofing Co., of Brooklyn, N. Y., capital $1,000, has been incorporated by J. J. Carroll, of 360 Leonard st., Brooklyn, N. Y., and two others.

The St. Louis Car Co. has received an order for 250 street cars for the Japanese government, to be shipped within 90 days.

A special meeting of stockholders of Tennessee Coal & Iron was held at Tracy City, Tenn., Sept. 15, to vote approval of the contract with the Alabama Steel & Ship Building Co., authorizing the acquirement of the securities of the latter company, whose steel plant at Ensley is now well under way.

The Struthers Furnace, at Struthers, made a new record recently for a furnace with 16-foot bosh and 75 feet high, its output for 24 hours being 302 tons of basic metal.

The Lane & Bodley Co., Cincinnati, has furnished a Corliss engine for the plant of the Old Meadow Rolling Mill Co., Scottdale, Pa. The mill will probably be in operation in a few weeks.

The Semet-Solvay Co. is putting in another battery of 30 ovens, at Ensley City, Ala., making 60 in operation at present.

The Whitaker mill at Wheeling, resumed last week in all departments.

The Michigan Brass & Iron Works, of Detroit, Mich., have been awarded the contract for $22,000 worth of valves and hydrants for the new water works for the city of Mobile, Ala.

The Case Mfg. Co., Columbus, O., has taken a contract from the Burgess Steel & Iron Co., Portsmouth, O., for a 60-ton electric traveling crane. It also secured an order for a 15-ton traveling crane to be shipped to St. Petersburg, Russia.

The Chambersburg (Pa.) Engineering Co. has recently received an order from the Burgess Steel & Iron Works, of Portsmouth, O., for one four-ton hammer and from the Schoen Pressed Steel Co., of Pittsburg, an order for three 100-inch hydraulic riveting machines.

Work on the new departments of the Aetna-Standard Iron & Steel Co.'s plant at Mingo Junction, O., is going forward rapidly. The steel plant is to be started in the near future.

The Star Works, at Allegheny, Pa., operated by Lindsay & McCutcheon, started five scrap and seven puddling furnaces last week.

The plant of the Greensburg (Pa.) Nut & Bolt Co. started this week.

The Edgar Thomson rail mills of the Carnegie Steel Co. is turning out 7,000 tons of 100-pound steel rails for the Pennsylvania Railroad, to be laid on the Middle division.

A Chicago dispatch says that the Scully Steel & Iron Co. has closed a contract for the delivery of 2,500 tons of steel plates to Victoria, B. C., to be used in the construction of five steamships by one of the largest ship building firms at that point. The value of the contract exceeds $100,000.

The 32 puddling furnaces of the Kittanning (Pa.) Iron Co. were started last Thursday.

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The A B C of Iron, Now $1.

Hecla Furnace, charcoal, at Ironton, O., is being improved. Six tuyeres are provided, instead of three, and the bustle pipe will extend around the stack.

The work of repairing the No. 2 Paxton Furnace at Harrisburg, is progressing as fast as possible. It is expected to have the furnace in operation in November.

The Kilby Mfg. Co., of Cleveland, has been hurrying the completion of some sugar machinery for Hawaii, in the past few weeks, and a shipment of four carloads was made a few days ago. Day and night and Sunday work was required, to get shipments off on time. There is just now a slight slacking of sugar work and some reduction in force will be made pending the development of new business. In the past 18 months these works have been very busy in sugar lines.

The contracts for four torpedo boat destroyers given the Maryland Steel Co., will soon employ a considerable force at the shipyard of the company.

Edward M. Hagar & Co., the Rookery, Chicago, have contracted with the Illinois Steel Co. for two 600 h. p. tandem-compound condensing Porter-Allen engines, to be built by the Southwark Foundry & Machine Co., Philadelphia. They are to be used for a central electric lighting and power station at the company's South Chicago plant, and will be direct-connected with 400-k. w. Westinghouse generators.

At Pottstown, Pa., the Glasgow Iron Co., lessee of the plant of the Pottstown Iron Co., is making preparations to start the 112-inch plate mill. This mill has been idle nearly three years.

The Furnaceville Iron Co., of New York, has added 100 men to the force working in its iron mines in Ontario, Wayne Co., N. Y., and three steam shovels and two derricks.

The Lidgerwood Mfg. Co., New York, a few months ago furnished a small traveling cableway for use in the construction of fortifications at Fort Pickens, Fla. Lieut. James P. Jervey, the engineer in local charge, has been able with this cableway to handle an average for 14 days of 830 tons per day, the maximum day's work being 1,000 tons. The record of each day's work in skips is given below. The average weight of each skip is two and one-fifth tons: June 14, 343; 16, 371; 17, 364; 18, 368; 20, 342; 21, 342; 21, 301 (two hours delay); 22, 406; 23, 364; 24, 416; 25, 440; 27, 416; 28, 448; 29, 464; 30, 440. Total, 14 days, 5,483. This excellent record illustrates the advantage frequently secured by running a light load fast instead of a large load slowly.

It is reported that the directors have decided not to rebuild the Reading (Pa.) Tin Plate Works, which burned last month. Material on hand will be sold out.

The Anchor Nail & Tack Co., Inc., of Pittsburg, just chartered with $45,000 capital, by Walter Chess, Harvey Chess and Oliver Boleman, succeeds to the business of the Anchor Nail & Tack Works.

Recent sales of Cohcrane feed-water heaters and purifiers have been made by the Harrison Safety Boiler Works, of Philadelphia, as follows: A. Goetzinger & Sons, Allegheny, Pa., 250 h. p.; Electric Storage Battery Co., Philadelphia, 500 h. p.; Berry & McFalls Milling Co., Harrisonburg, Va., 75 h. p. special; Wm. H. Grundy & Co., Bristol, Pa., 425 h. p.; American Coffee Co., Brooklyn, N. Y., 600 h. p., special; St. Louis Car Co., St. Louis, Mo., 500 h. p.; J. M. & V. Weil, Chicago, 150 h. p.; Lobdell Car Wheel Co., Wilmington, Del., 350 h. p.; Andrews & George, Yokohama, Japan, 50 h. p.; Edwin S. Hartwell Lumber Co., 500 h. p.; Chas. H. Hayes, Haverhill, Mass., 450 h. p., special; Chicago (Ill.) Portland Cement Co., 500 h. p.; Westinghouse, Church, Kerr & Co., Chicago, 100 h. p.; Western Linoleum Co., Akron, O., 250 h. p.; Cleaver, Paddock & Co., Chicago, 500 h. p.; Cambria Iron Co., Johnstown, Pa., 4,000 h. p.; Unviersity Club, Philadelphia, 150 h. p.; Norton Bros., Maywood, Ill., one 500 h. p.; one 350 h. p.; Pabst Brewing Co., Milwaukee, Wis., 100 h. p.; Scottdale Heat, Light & Power Co., Scottdale, Pa., 350 h. p.; Milwaukee Public Library-Museum Bldg., 400 h. p., special; John A. Scott, Shawnee, O. T., 50 h. p.; J. G. Powledge, Aubrey, Tex., 50 h. p.; Beadling Bros., Beadling, Pa., 600 h. p.; Northern Grain Co., Elevator, Manitowoc, Wis., 350 h. p.; Ice & Cold Machine Co., St. Louis, Mo., 50 h. p.; New Market House, Pittsburg, 300 h. p., special; United Gas Improvement Co., Philadelphia, 1,500 h. p.; Alhambra Theater, Chicago, Ill., 100 h. p.; S. S. White Bldg., Philadelphia, 200 h p.; Crawford Bldg., St. Louis, 450 h. p., special; Chicago-Rockford Hosiery Co., Kenosha, Wis., 500 h. p.; John Druecker, Chicago, 300 h. p.; Thos. K. Carey & Bros. Co., Baltimore, Md., 250 h. p.

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